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ABSTRACT

This book outlines sloyd educational theory ("sloyd" being an umbrella term for different educational crafts in various areas and at different levels of the educational system whose scientific basis lies in crafts science). The following topics are among those discussed: methodological framework of research on sloyd education; sloyd education in various areas and at various levels within the educational system; teaching-studying-learning process in sloyd education and the steering system; the basic theories (educative sloyd as a holistic activity system, functions within the sloyd activity system, dimensions of educative sloyd actions, directions and strategies in educative sloyd actions, formative results of educative sloyd actions and learning); knowledge areas within sloyd education (knowledge related to sloyd production, knowledge related to the work object, overall knowledge areas); pupils' educative sloyd process and application of sloyd theories in education (dynamic-evolutional thinking; the experienced educative sloyd process and normative steering system; perspectives of description; the design, planning, and manufacturing phases); and emergence of a hierarchical systems theory of sloyd education. The report contains 44 references and 13 figures. Appended are a diagram of the sloyd educational process and an annotated bibliography of 12 research studies on sloyd education. (MN)

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Department of Teacher Education
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Sloyd Education in the Cultural Struggle
Part VIII

An outline of a sloyd educational theory

Linnéa Lindfors

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Abstract

The summarized theories in this report are results of sloyd educational research at the Department of Teacher Education, Åbo Akademi University in Vaasa/Vasa. They have been published in Swedish from the beginning of the 1990s onwards The internationalization of sloyd educational teaching and research has made it necessary to publish research results in English. The present report includes summaries of basic theories of a general character to be used as an orientation in changing teaching and research contexts, i. e. the theories are not closely connected with specific situations or epochs.

The presentation starts with two frame theories: The theory of *sloyd education representing various areas and levels within the educational system* and the theory of *the teaching-studying-learning process and steering systems in sloyd education*. The theory of *educative sloyd activity as a holistic system* can be applied as a frame of reference for teaching and research on the actor's own world, the technological-aesthetic world, the world of social interaction and the surrounding world. This holistic theory is suitable as a frame of reference for both smaller and larger research projects and forms a frame of reference for individual theories. The last mentioned cover so far specified aspects of the actor's world and the technological-aesthetic world of the holistic system. All together the theories form a *hierarchic systems theory of sloyd education*. The report ends up with a discussion and exemplification of the application of the theories in applied research.

Keywords Sloyd education, sloyd educational theory, activity systems, sloyd, craft and design.

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Abstrakt
Teorierna som sammanfattats i rapporten är resultat av slöjdpedagogisk grundforskning vid Åbo Akademis institution för lärarutbildning i Vasa. Forskningen har publicerats på svenska från och med början av 1990-talet. Internationaliseringen av slöjdpedagogisk utbildning och forskning har nödvändiggjort forskningsrapportering på engelska. Den föreliggande rapporten innehåller sammanfattningar av centrala teorier med generaliserbar kunskap som är användbar som orienteringsgrund i föränderliga undervisnings- och forskningskontext, dvs. teorierna är inte hårt bundna vid en specifik situation eller tidsepok.

Presentationen inleds med två ramteorier; teorin om *slöjd och slöjdpedagogik inom olika områden och på olika nivåer i utbildningssystemet* samt teorin om *undervisningsprocessen i slöjd jämte styrningssystem.* Teorin om *edukativ slöjdverksamhet som helhetssystem* kan användas som referensram för såväl undervisning som större och mindre forskningsprojekt gällande undervisning och forskning gällande aktörens värld, den teknologisk-estetiska världen, den sociala världen och omvärlden. De sistnämnda täcker för närvarande specificerade delområden inom individ- och teknologirelaterade aspekter i helhetssystemet. Rapporten utmynnar i konstruktion av en *hierarkisk systemteori i slöjdpedagogik.* Teoriernas tillämpningen i undervisning och forskning diskuteras och exemplifieras.

Sökord: Slöjdpedagogik, slöjdpedagogisk teori, verksamhetssystem, slöjd, hantverk, design (fi: käsityökasvatus, käsityökasvatuksen teoria, toimintasysteemi, käsityö, muotoilu).

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Preface

In the present report I have in a concise form put together sloyd educational theories which I have developed in the course of a long succession of years. The reason why I have chosen to compose this summary report in English is a natural result of the increasing demand for literature in English in the field of internationalized sloyd education and research. The major-subject status of sloyd education in the education of teachers and right on up to doctoral level will also profit by an outline of the the most basic theories. I also consider it urgent to present, in a concise but penetrative manner, the specific sloyd educational paradigm developed at the Department of Teacher Education, Åbo Akademi University in Vaasa/Vasa. Although sloyd education and crafts science are fairly recently established fields of science, various paradigms have already been developed in Finnish universities.

The theories have been tried out and thus evaluated in teacher education and postgraduate studies as soon as they have been published – sometimes even while still existing only in manuscript form. Both in my educational and research work I have received help and support from my young colleagues at the Unit of Sloyd Education and Home Economics of the Department of Teacher Education and at the Vasa Övningsskola Teacher Training School. Over the years both sloyd and class teacher students have been confronted with such theories, which at first may have seemed incomprehensible but little by little have consolidated the subjects studied, technical sloyd and textile sloyd. Now that I have retired, my work continues thanks to the teacher educators and the teacher students. For all this I express my heartfelt thanks and wish you success and good luck in teaching in the sloyd educational field at various levels, in your task of fostering through sloyd and in developing the sloyd educational paradigm further.

The outline report is published in the series of Reports from the Faculty of Education, Åbo Akademi University, as a sequel to the previously published reports of the project *Sloyd Education in the Cultural Struggle*, something I am grateful for. Finally I wish to thank Rolf Lindholm for his perceptive and linguistically sensitive work in checking the English language of the report.

Korsholm, March 1999

Linnéa Lindfors

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Definitions of main terms

1. Sloyd terms

Sloyd

- A umbrella term for different educational crafts in various areas and at different levels of the educational system whose scientific basis is to be found in the science of sloyd education and/or crafts science;
- Common name for school subjects within the field.

Sloyd actor

An individual (the pupil) acting (working) in sloyd/the teacher or the fellow pupil involved in sloyd activity/sloyd educational activity.

Sloyd actions

Psychical and physical organization and regulation of processes within a holistic sloyd activity system.

Sloyd activity

A holistic working situation in sloyd/sloyd education.

Sloyd activity system/Dynamic-evolutional sloyd system

A theory of sloyd/sloyd education as a holistic working situation in sloyd/sloyd education.

Sloyd, area of interest

A larger sphere of activity including different forms of knowledge and various sloyd actions – a wider sloyd activity system.

Sloyd education

- An academic subject and research field in teacher education and doctoral studies.
- Educating and fostering an individual through sloyd.

Sloyd functions

Holistic sloyd activities related to the worlds within the holistic sloyd activity system (the actors' own world, the technological-aesthetic world, the world of social interaction, the surrounding world).

Sloyd object

The work object, a concrete/abstract task, within a sloyd process.

Sloyd operations

Manual sloyd actions within a holistic sloyd activity system.

Sloyd, organizing-regulating activities

Psychical and physical sloyd actions (work processes) within a holistic sloyd activity system.

Sloyd process/production process/production

Production-releated psychical and physical sloyd actions within a proceeding holistic sloyd activity system, including designing, planning of manufacturing and manufacturing.

Sloyd product/article

A concrete result of a the sloyd process (a concrete artefact).

Sloyd work

Psychical and physical sloyd actions (work processes) within a holistic sloyd activity system.

2. Other terms

Craft and design

- Name of school sloyd e. g. in Sweden (The Swedish Board of Education, Skolverket, 1994).
- Subject areas at institute and polytechnical levels e.g. in Finland (Ihatsu, 1996, p. 112).

Educational craft and design

Subject areas in teacher education; studies in crafts science or science of sloyd education at the university level.

Method

A methodic way to proceed with regard to a specified basis, a proceeding strategy.

Technique

A summary of rules, specificed grasps and skills which have to be used in connection with them.

Technology

The science of techniques, the theories concerning the qualities of raw materials and how to work up raw materials.

1. Introduction

1.1. The motives of the report

Starting while I was a Teacher educator at the Department of Teacher Education, the Faculty of Education, Åbo Akademi University, and later on as Professor Emerita, I have been doing research work within the field of sloyd education and published a great number of research reports. My main research results are consequently scattered in different publications. My theories have also been developed in later published reports, and the material is therefore difficult to obtain. This circumstance is the primary reason for publishing my principal findings in one more terse report.

A second reason is the need to publish the research results in English. Gradually teaching and research in sloyd education have been internationalized and there is a great demand for literature in English. In order to make the theories that have been produced available and put into practice, the most important ones were translated into English in the form of a compendium, which immediatly was in great demand in the home country as well as abroad.

A third reason for publishing a summary of the research results in English is the ongoing effort to develop a standardized sloyd terminology in English. This work was already started in earlier publications in English and has been made use of in this outline report. Hopefully the report will also make sloyd and sloyd educational keywords in the data base for educational research, "Thesaurus of ERIC Descriptors", more complete.

This report serves to meet the demand; it includes a collection of the most basic theories I have created in my early research. The theories form a scientifically grounded, and often also empirically tested, collection of generated knowledge. As a result of this report a hierarchical systems theory emerges. The theories are thus abstract constructions which represent the reality. They will provide a structured basis for the user, the researcher as well as the teacher. In this report only the research results will be publicized; descriptions of the research processes and the underlying literature are to be found in the original research reports published in Swedish. (See the reference list.)

The presentations in the report are subject specific and the reporting terse; the reader is assumed to be familiar with the field in question. In order to facilitate the reading, the central terms have been defined/explained at the beginning of the report.

1.2. The background of the sloyd educational research

The background to my way of thinking about sloyd, sloyd education and sloyd educational research within the educational system is described in the introduction to my doctoral thesis, and I will reproduce parts of it below (Lindfors, 1992a).

Research in sloyd education has its basis in the school subjects technical sloyd and textile sloyd. These subjects again have their roots in domestic sloyd, which was practised by ancient tradition in self-subsistent households. In those days sloyd was a comprehensive activity, which involved children and the young in the entire production process, in the preparation of raw material like flax, wool and different kinds of wood, in designing/planning and manufacturing products. The products were clothes, home textiles, articles of furniture and farming implements. Such comprehensive activities led to proficiency in various sloyd (crafts) techniques but also provided insights into ecological, aesthetical, ethnological and economic matters. Furthermore, it is possible that sloyd activities performed in company with other family members and neighbours fostered the social and ethical consciousness and responsibility of children and the young. Educational and psychological aspects were integrated into the sloyd activities themselves and into the proficiency in sloyd handed on to posterity. Sloyd activities had one and all a cultural function in the society of the time.

It was this sloyd activity, including the manufacture of concrete products, which constituted the basis when technical sloyd and textile sloyd became subjects in the schools and in teacher education in the 1860s. When schools took over the responsibility for teaching sloyd (crafts), the goals as well as the content became artificial. School sloyd was to offer material as well as formal education. Both the usefulness of learning sloyd skills (instrumental and economic aspects) and the fostering aspects were included in the educational goals of sloyd. In practice there was a contradiction between these two directions.

In the debate about school sloyd, it has not been noticed that a subject theory as well as an educational theory had on the whole been lacking from the sloyd subjects right up to the 1980s. Now that research has been started in both sloyd education and crafts science it is possible to go deeper into these problems – down to their philosophical foundations. In the theories described in this report, the ontological and epistemological fundamentals have been sought in phenomena which were topical even when the teaching of sloyd was moved from the homes to the schools displaying their aesthetic-productional character within the framework of holistic activity systems.

1.3. The leading research idea

The leading idea in my research is that the substance of sloyd education (technical sloyd and textile sloyd) is a mix of "pure" substance elements and educational elements while craft science deals with the "pure" substance of the subject. The ontology of sloyd education is therefore extremely complex; both the "pure" substance and the educational elements are complex themselves.

The starting point for my research was a dynamic-evolutional way of thinking about sloyd activity in an educational context. The term evolutional means that the activity is conscious, developing and holistic. My opinion was, and still is, that the constructivistic conception in education only covers the rational approach to studies, which could be used to acquire knowledge. (Section 5.4). Sloyd educational activity has to be conceptualized as an ongoing holistic human system where the actor (the pupil, the teacher or the fellow-pupil) is part of the sloyd activity system itself and of the surrounding social and socio-cultural systems.

The theories are constructed as hierarchical systems which together form a *holistic systems theory* (Chapter 8). In the report the individual theories will be presented in the following order:

- A theory of areas and levels of sloyd education
- A theory of the experienced teaching-studying-learning process of sloyd education, and the steering system

- A theory of educative sloyd as a holistic activity system:
  - Functions within the individual sloyd activity system
  - Actions within the individual sloyd activity system
  - Directions and strategies in educative sloyd actions
  - Formative results of educative sloyd actions
  - Learning
- Knowledge areas within sloyd education
- A theory of phases and steps within the pupil's educative sloyd process

The hierarchical systems will be summarized as a whole in Chapter 8, Figure 8.1:1). The individual theories have to be used as instruments for understanding and structuring the sloyd educational field in the curriculum and syllabus as well as in studies and research from a dynamic-evolutional point of view.

> *The knowledge of the generated theories is universal and its reality-related form will be constituted in a context, i.e., in various educational areas and levels of the educational system.*

2. The methodological framework

In the research on sloyd education at Åbo Akademi University, Vasa, the sloyd educational *ontology* has been described, and a theory of knowledge, an *epistemology*, has been built up chiefly by the aid of soft systems methodology within the framework of an evolutionist systems theory (Checkland, 1986; Jantsch, 1975, 1987). The theories which have been generated in basic research describe verbally and with the aid of conceptual models *"what seems to be there"* and *"what kind of processes seem to go on there"*. The models of educative sloyd activity constitute fluctuating, hierarchically structured systems (Lindfors, 1991b, 1992a; Malmberg, 1995; Sandelin, 1984).

I conceive the sloyd educational research objects as integrated entities of *dynamic-evolutional* systems theories, not as parallel or successive explanatory theories which describe sloyd and educational activity separately (Lindfors 1997). C. Nygren-Landgärds has been doing research on the integrated content of sloyd education (various subdisciplines of ongoing sloyd activity) as the subject of the teacher educator and the teacher student (Nygren-Landgärds, 1997).

The theoretical constructs are neutral with regard to value; they are not bound to any educational ideal. They are to be regarded as frames or focusing perspectives which provide defined, structured points of departure for teaching, studying and applied research in different educative contexts. Thus it is not only a question of theories that are to be verified but of theories that are to be developed by continued basic and applied research.

In this report research metodological aspects of the created theories are not dealt with (See Lindfors, 1997).

3. Sloyd education in various areas and at various levels within the educational system

In the introduction I established that the leading idea is that the generated theories are universal, and that their reality-related form will be constituted in a context, i.e., in various educational areas and at various levels of the educational system. The theories are thus abstract constructions which represent the reality. They will provide a structured basis for the user, for the teacher as well as for the researcher.

In this section I will present a theory which has been developed in order to do research on research, to identify research areas, aims and sloyd activity systems as well as teaching-studying-learning systems within sloyd education (Lindfors, 1993a, 1994, 1997; Nygren-Landgärds, 1997).

The sloyd educative substance will appear at least on six subject levels as illustrated in Figure 3:1. Sloyd education as an academic discipline will be divided into four levels, i.e. the researcher educator's (the professor's) subject, the doctoral student's subject, the teacher educator's (the professor's/the lecturer's/other categories of teachers) subject and the teacher student's subject. The teacher educator could of course also be a doctoral student or a researcher with a doctor's degree. In teacher education, sloyd education (including technical sloyd/textile sloyd) has to be taught and studied as a *subject of teaching*. The teacher educator's subject includes the teacher student's subject and the two subject levels at school taught in conection with sloyd educational theory and overall areas of sloyd educational history, philosophy, theory of science and philosophy of science (Section 5.1. The teacher student's subject includes the two subject levels at school which will be studied in conection with sloyd educational theory and overall areas.

The researcher education program reprecents the *subject of research*, including all subject levels in the field, in fact all areas and levels within the science of sloyd education. Because the sloyd teachers in Finland reach the Master's degree sloyd education also has to be taught and studied as a subject of research, but on a *pregraduate* level (Lindfors, 1995, 1997; Nygren-Landgärds, 1997).

In schools, sloyd is studied as a school subject. There we can find the *teacher's subject* and the *pupil's subject*. Outside the university, sloyd as well as educative crafts and design can be found in general (all-round) as well as vocational areas and at various levels of the educational system, from nursery schools to adult education, teacher education and doctoral studies at a university. Sloyd educational research deals with all levels (Lindfors, 1993a). In Figure 3:1 those fields which could be regarded as sloyd educational teaching-studying-learning systems and research fields are presented.

The idea behind the grouping of different fields of sloyd/sloyd education and educative crafts and design is that they have a general core. The definition is as follows:

> *The general core, representing the ontology of "pure" sloyd or crafts and design will receive its context-dependent educative form of expression, a sloyd educational ontology, within the educative directions and levels illustrated in Figure 3:1.*

The general (all-round) direction in sloyd educational research and teaching is closer to the theories of the science of general education and the science of adult education, the vocational direction is closer to the theories of craft science and the science of vocational education. Both sloyd education and craft science are multi-scientic, influenced by various cultural and humanistic sciences. Moreover technological and natural sciences will influence crafts science. In sloyd education technological and nature-related substance has to be caught from crafts science (Lindfors, 1995, 1997, 1999b).

The substance levels, general (all-round) or vocationally directed in the educational system, are enclosed within an educational context, which in turn is surrounded by a sociocultural context. This means that the subjects, in various contexts and at various levels, represent the four worlds of the theory of educative sloyd activity as a holistic system (Section 5.1). The actor (e. g. the pupil, the fellow pupil, the teacher) represents the actor's own world and together with the technological-aesthetic world they establish the core of the subject. Round the core are the world of social interaction and the surrounding world, i.e. the educational system and the society.

Examples of how the theory presented above has been applied in researsh are to be found in Appendix 2, Studies II, IV and VI.

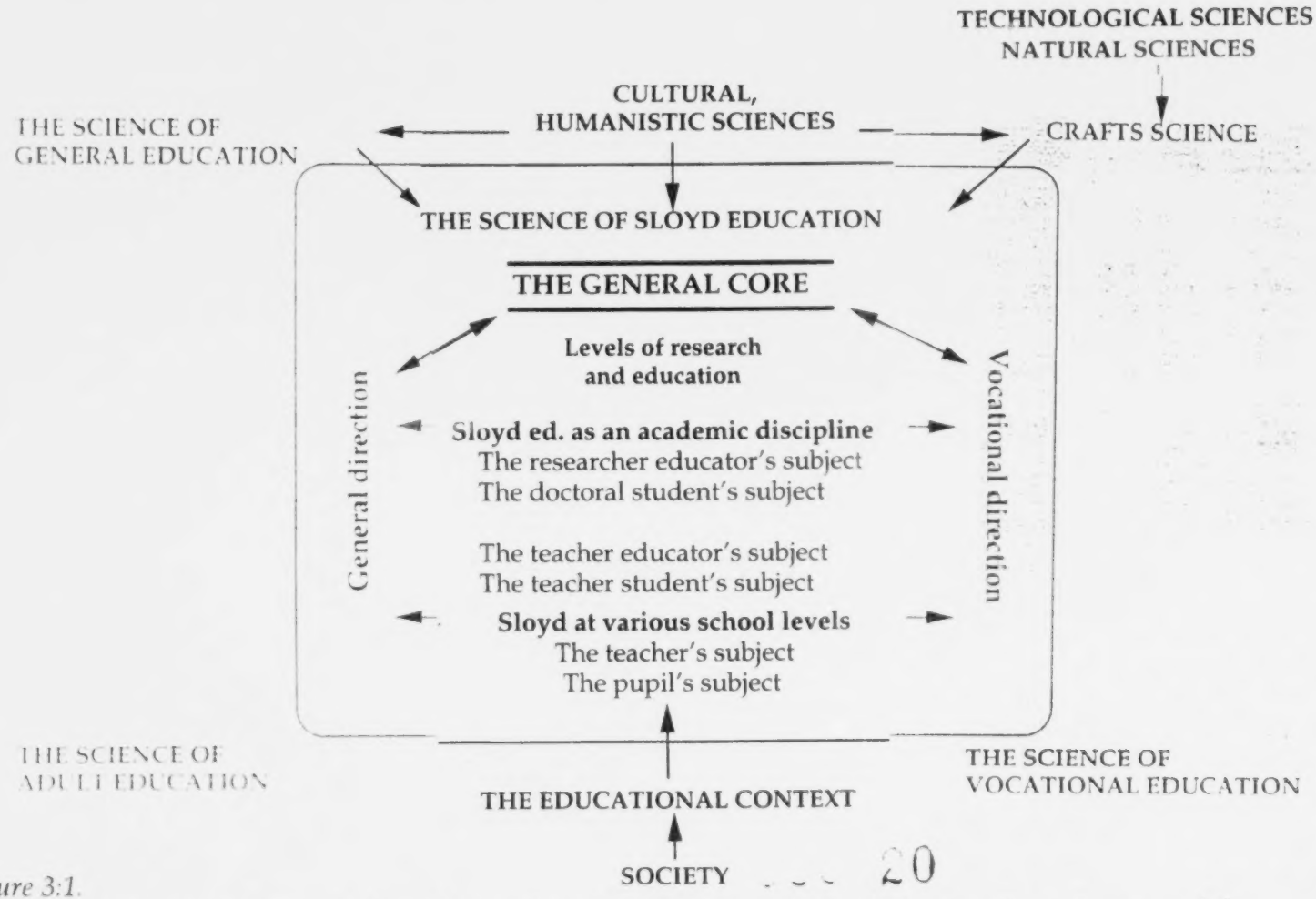

Figure 3:1.
Sloyd education as an academic discipline and a school subject, and its relation to other sciences and the context of education and society. (Modified from Lindfors, 1997, 1999b and Nygren-Landgärds, 1997.)

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4. The teaching-studying-learning process in sloyd education and the steering system

In research and planning of teaching, it is illuminating to distinguish between different curriculum levels. The first level is constituted of the national curriculum, also called the preliminary plan. At the local level more detailed curricula are worked out, which take communal and individual school interests into consideration. Annual course, sequence and lesson plans are created at teacher and pupil level. The teaching-studying-learning process is the curriculum level as experienced by teacher and pupils (Lindfors, 1997, pp. 43–44; Cf. Lahdes, 1986, pp. 82–83; Lundgren, 1979, pp. 19–23).

At an early stage of my research on sloyd education, I worked out a holistic theory for the teaching-learning process in sloyd education which can be applied in *various educational areas* (contexts and levels of education) (Figure 4:1) (Lindfors, 1987, pp. 48–51; 1990b, pp. 12–26). The theory comprises 1) *sloyd as a normative system* and 2) *sloyd as an educative process.* Within sloyd as a normative system the first three curriculum levels are found. The national curriculum presents directions for *frame factors* and *syllabus factors.* The frame factors are of both macro- and micro-character, that is, they are factors that concern the whole educational system (site of school, community, culture, traditions, etc.) and factors that concern the subject (number of hours, size of groups, physical environment, etc.). The subject factors are constituted of intentional factors in the curriculum or in the syllabus, such as goal-setting, material- and method-directions. The frame and syllabus factors reach the teaching-studying-learning process in the form of an *annual course, a sequence* and *lesson plans,* that is, at curriculum level three the normative system in the form of objectives reaches the teaching-studying-learning process where education takes place

The educative process contains four factor categories: teachers, pupils, interactive situations and results. By means of this formation, the teaching dimension, determined by the teacher's result expectations, and the studying (including work training) and learning dimension, determined by the pupil's result expectations, are distinguished. Teacher factors influencing the teaching are for example the teacher's personality, education and professional career. Pupil factors which influence the teaching are the pupil's individual readiness and motivation and the readiness and "group

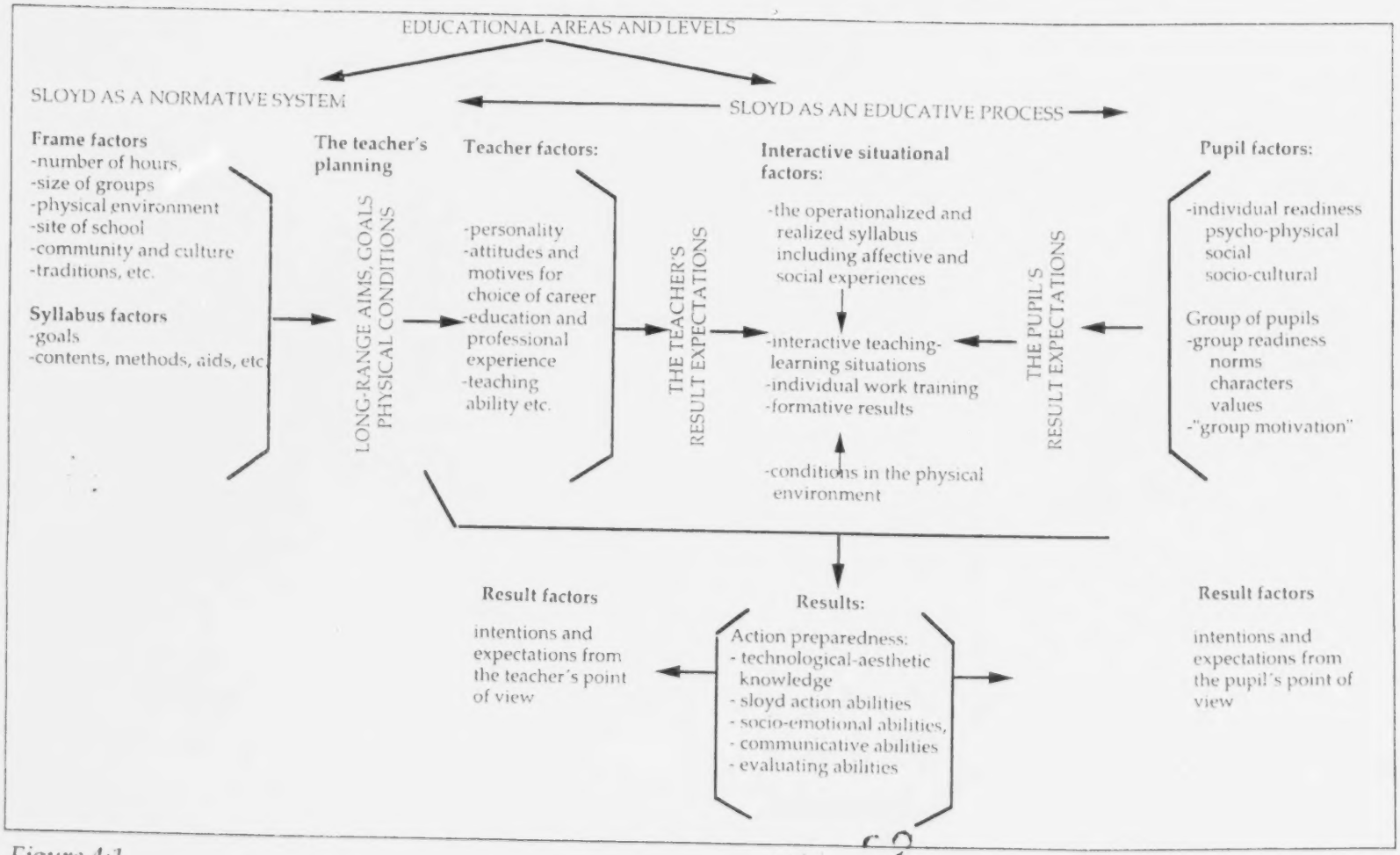

Figure 4:1.
Holistic theory of the experienced sloyd teaching-studying-learning process and the steering systems. (Modified from Lindfors, 1990b, p. 13, 1991a, p. 48.)

readiness and motivation" of a group of pupils. (Lindfors, 1991a, pp. 48; cf. Koskenniemi et al., 1977, p. 21; Saylor & Alexander, 1974, pp. 11–12)

Observable factors concerning teaching are labelled as *interactive situation factors*. These include partly all forms of interactive teaching situations (group teaching and guided work practice), partly individual independent work (properly speaking not directly interactive) or other exercises. The pupil's entire sloyd process, described below in Chapter 7, is going on within the interactive situation. Furthermore, the interactive situational factors include the substance of teaching-studying-learning, that is, the operationalized teaching content and the pupils' sloyd activity (the objectives) as well as the realized teaching-studying-learning objectives (formative results). The situational factors also include affective and social experiences and communicative factors. Conditions of the physical environment such as teaching aids, tools, work materials and fixtures constitute situational factors which affect interaction in the teaching-studying-learning process.

The result factors form the fourth factor category in the teaching-studying-learning process. These are understood as process results, determined by the syllabus and by the teacher's and the pupil's result expectations. The process results in the form of long-range results have been arranged under the concept of *action preparedness*, which in the goal-result dimension encompasses technological-aesthetic knowledge of sloyd, knowledge of overall domains comprising various themes, skills in sloyd work (sloyd actions), socio-emotional integrity, communicative abilities and questions concerning values (Lindfors, 1991b, pp. 36–39, 47–49).

Examples of how the theory presented above has been applied in researsh are to be found in Appendix 2, Studies I, VII and IX .

5. The main features of some basic theories

5.1. Educative sloyd as a holistic activity system

The structure of the theory
The generated knowledge of sloyd education has been combined into *a main theory of educative sloyd activity as a holistic system* (Figure 5.1:1). The activity is organized and regulated by the individual (the actor) in action while expansion and progression within the system are drawn as the axes in the figure illustrate. The holistic system comprises an aspect related to the individual (the world of the actor), a technological-aesthetic aspect (the technological-aesthetic world), a situation-related aspect (the world of social interaction) and an environment-related aspect (the surrounding world, culture and nature). The worlds contain *theoretical* as well as *practical* and *productional* (dynamic-evolutional) knowledge and activity content used in the teaching-studying-learning process, and in research on sloyd education. The knowledge is structured within various subdisciplines in each respective world. For example, the actors world comprises sloyd psychology and aesthetic aspects of sloyd related to the individual, while the technological-aesthetic world is made up of sloyd technology, sloyd ergonomics and sloyd economy as well as of aesthetic aspects of sloyd related to production and products (Lindfors, 1990a, 1991b, 1997).

Round the core of sloyd activity there is a shell, that is, the world of social interaction and the surrounding world. Subdisciplines within the world of social interaction are sloyd sociology and sloyd ethics and within the surrounding world sloyd ecology, sloyd ethnology and various cultural sciences. Sloyd situations may occur at school, at the university or at home or somewhere else where there is equipment for sloyd activity. In most cases many people are engaged in sloyd together and then concrete social and communicative processes come to the fore. Sloyd activity is constantly interacting with the surroundings. It may be a question of materials, tools, traditions derived from nature or culture or regular steering through political documents (e.g. curricula). In sloyd related to education, the didactic dimension is thus added.

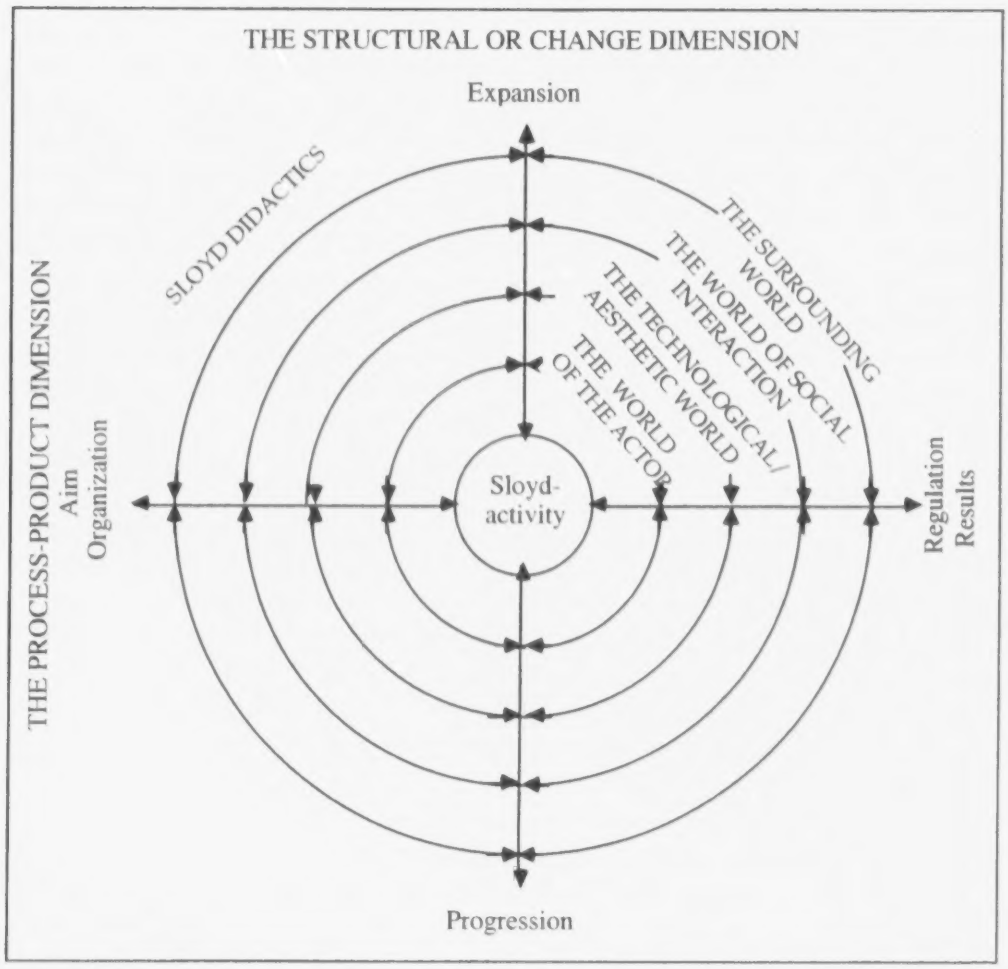

Figure 5.1:1.
A theory of individual sloyd activity as a holistic educative system (Lindfors, 1991b, p. 22).

On the basis of systematized knowledge of sloyd activity as a holistic system the nature of sloyd can be defined as follows:

> *Sloyd activity consists of technologically-aesthetically determined unique sloyd actions connected with the sloyd materials whereby sloyd products are designed, planned and produced within the holistic activity represented by the core and the shell of the subject field, including its history* (Lindfors, 1991b, p. 23).

The definition has general validity. Different contexts and different motives or purposes result in different forms of sloyd, such as school sloyd and sloyd in connection with teacher education, domestic crafts, artistic crafts, art industry and therapy. (Lindfors 1991b, pp. 21–24; 1995, pp. 21-22; Cf. Peltonen, 1988, pp. 23–32).

Above it was made clear that the system of sloyd activity comprises static as well as dynamic elements, "what seems to be there" and "what kind of processes seem to go on there". In the holistic model of sloyd as an activity system (Figure 5.1:1), what is going on is illustrated by means of axes going vertically and horizontally through the system. In the process-product dimension, organizing and regulating take place proceeding from the aim towards the result. The vertical axis illustrates growth and development (expansion and progression). The axes divide the whole system into four sectors, within which different forms of activity can be distinguished (Lindfors, 1991b, pp. 23–24). The following aspects constitute the basis of the definition of sloyd activities as a dynamic-evolutional system: organization–regulation and expansion–progression. Malmberg (1995) has described the contents of the four sectors in more detail. Sloyd activities are determined by a motive–result ideal, a projected configuration, an inner world model of process and product which is transformed and realized continuously (Lindfors, 1991b, pp. 122-123).

> *The starting-point for the theory and philosophy of sloyd education is the production process, i. e. designing, planning and producing of concrete objects in the framework of the holistic system presented above.*

To begin with, research was aimed at the ontology and epistemology of individual (universal) sloyd activity. After this, the pedagogical dimension has been applied to the construction of systems. When sloyd activities are performed for the purpose of education, steering functions and other educative aspects determined by curricula will come into the picture. It is self-evident that educative sloyd activity is far more complex than individual self-steered sloyd activity.

The theory described above can be used in such a way that the activity, in addition to the sloyd activity of the pupil, can also be applied to the activity of the teacher/teacher educator or a fellow-pupil.

Examples of how the theory presented above has been applied in researsh are to be found in Appendix 2, Studies III, V and VIII.

Hierarchical levels of research and teaching

The dynamic-evolutional nature of sloyd activity further complicates research and teaching-studying-learning in the field. These characteristic features presuppose a specific form of *sloyd didactics* (Cf. Peltonen, 1988, summary).

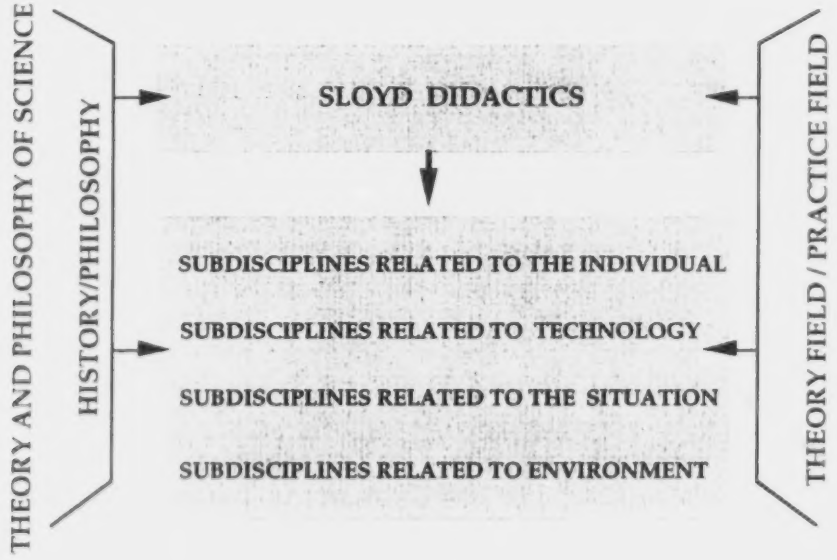

Figure 5.1:2.
Research fields in the science of sloyd education. In teacher education, and in the teacher's work, sloyd didactics is integrated in the "pure" subject substance.

Sloyd didactics is a superordinate system, which in practice has to be related to the content of the different disciplines in the sloyd worlds (Figure 5.1:2, See Figure 5.1:1). By conceiving of *hierarchical levels* within the system considering the disciplines as fields of both theory and practice, the understanding of the sloyd activity system for the purposes of research and teaching-studying-learning is made easier. All these disciplines can, in turn, be studied from *a historical* and *a philosophical* angle. All these fields (the subdisciplines including sloyd didactics, sloyd history and sloyd philosophy) can be the subject of research within *the theory of science* and *the philosophy of science*. (Cf. Lindfors, 1990a, pp. 21–24).

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The individual sloyd activity as a hierarchical system

When sloyd is studied as an individual process disconnected from situational aspects (the world of social aspects) and aspects of the the surrounding world, the core of sloyd emerges more clearly (Lindfors ,1985, pp. 96–126; 1991b, pp. 61–69). The model (Figure 5.1:3) thus includes the individual-related aspect and the technological-aesthetic aspect of sloyd. The unique sloyd actions and the holistic sloyd activity always emanate from a motive that may be due to a material and/or a formal result ideal. *A motive-result ideal* is understood as the vision, the projected configuration, of the activity in the actor's inner world in *both* the process and the product dimension.

A material motive-result ideal is for example the manufactured sloyd object as such or an economically determined cause. The formal motive-result ideal can be educative (as in school sloyd), social or in some other way immaterial by its nature. (Hacker, 1982, pp. 17-18; Leontjev, 1975, p. 15; Peltonen, 1988, pp. 22-33.) In educative sloyd, the sloyd work and the product are experienced by the pupil as unnecessary or artificial in case the pupil does not accept the motive for sloyd work represented by the curriculum and the teacher.

The motive-result ideal of sloyd activity makes the actor/the pupil act. In organized sloyd, the activity is goal-oriented. However, in creative sloyd processes, apparently irrelevant actions may appear. The psychical aspects of sloyd actions are identified as the ability to work in a goal-oriented manner and foresee developments in reality, availing oneself of this when engaged in sloyd work, for instance through manual actions, and as a goal-oriented interest in learning.

The sloyd actions – the work – is in the present report seen as the starting-point for the holistic sloyd activity system. As has been made clear before, the system includes, in addition to the sloyd process itself, the actor – the sloyd *subject* – and technological-aesthetic factors, situational and environmental factors which are specific to every given occasion, as well as a historical dimension. In educative sloyd the didactical dimension will appear.

The actor engaged in sloyd constitutes a superordinate system in the sloyd activity system. The other elements – the subsystems – are

1) the work object, 2) the various aids, 3) the formal result and 4) the material result. The elements of the system are connected with each other through different kinds of *relations*. All the relations that make the system holistic form the *structure* of the system. The

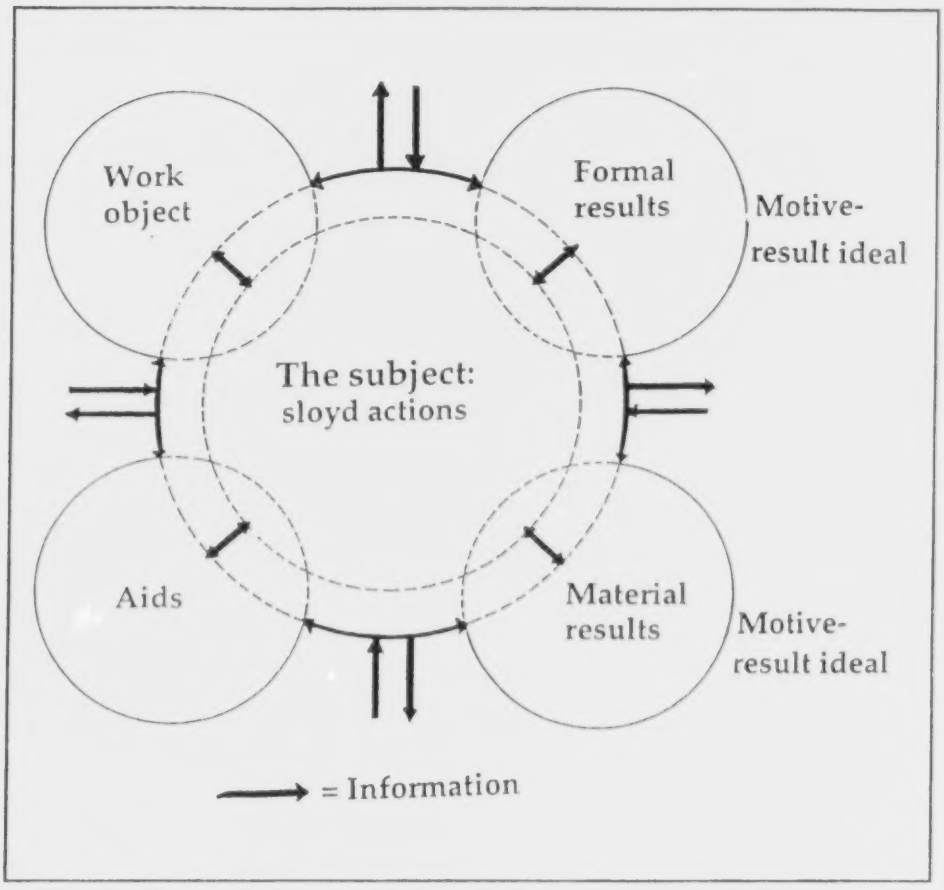

Figure 5.1:3
The theory of sloyd as an individual system of activities. (Modified from Lindfors, 1985, p. 109; 1991b, p. 25.)

internal relations of the system and its relations to the social and the surrounding worlds depend on the *flow of information* (input, output and feedback information). The relations within the system and its relation to the social and the surrounding worlds are guided and regulated through different *functions, sloyd actions*. Here the psychical and physical organization of the work is of central importance. Dimensions in the sloyd actions will be described in

Section 5.3. (Figure 5.3:1). Systems and subsystems are *hierarchic* by nature, that is, they exist on different system levels in relation to each other.

These system concepts are used for the purpose of structuring, in order that the structure of the sloyd activity system will appear clearly. For teaching and learning purposes it is necessary to be conscious of the static structures as well as of the dynamic-evolutional aspects.

An example of how the theory presented above has been applied in research is to be found in Appendix 2, Study X.

5.2. Functions within the sloyd activity system

Earlier it was pointed out that the sloyd educational teaching-studying-learning strategies as well as the research approaches, which follow the theories, are dynamic-evolutional by nature. This means that *planning, carrying out, analysing and evaluating* teaching-studying-learning have to take into consideration the nature of the systems. In order to analyse and evaluate doctoral and master's theses, I created *A theory of functions within the sloyd activity system* (Figure 5.2:1) which is useful for the presentation of basic and applied research in Chapter 8. The theory is also useful as providing a structured basis for other activities as well as for research in sloyd education. The teacher (and perhaps also the pupil) has to be aware of the different functions within the worlds of the holistic activity system in order to plan, to carry out, analyse and evaluate teaching-studying-learning. The presentation below is extremely brief, only the most central aspects will be mentioned (Lindfors, 1997) .

The theory is developed from the theory of educative sloyd as a holistic activity system. (Section 3.1.) The dynamic-evolutional nature will be pointed out by the *actor's* (the teacher's, the pupil's, the fellow-pupil's) *acting* within the three worlds (the technological-aesthetic world, the world of social interaction and the surrounding world) as *functions*. The actors are the subjects of the sloyd work and the teaching-studying-learning process; they represents the actors' own world. The actors organize and regulate the functions within the worlds outside themselves.

The production of sloyd products is going on within the technological-aesthetic world, which in the school situation moreover is educative acting. The entire activity is steered by sloyd educational theory as well as the by curriculum and other steering instruments. This function is summarized in the expression *function of production*.

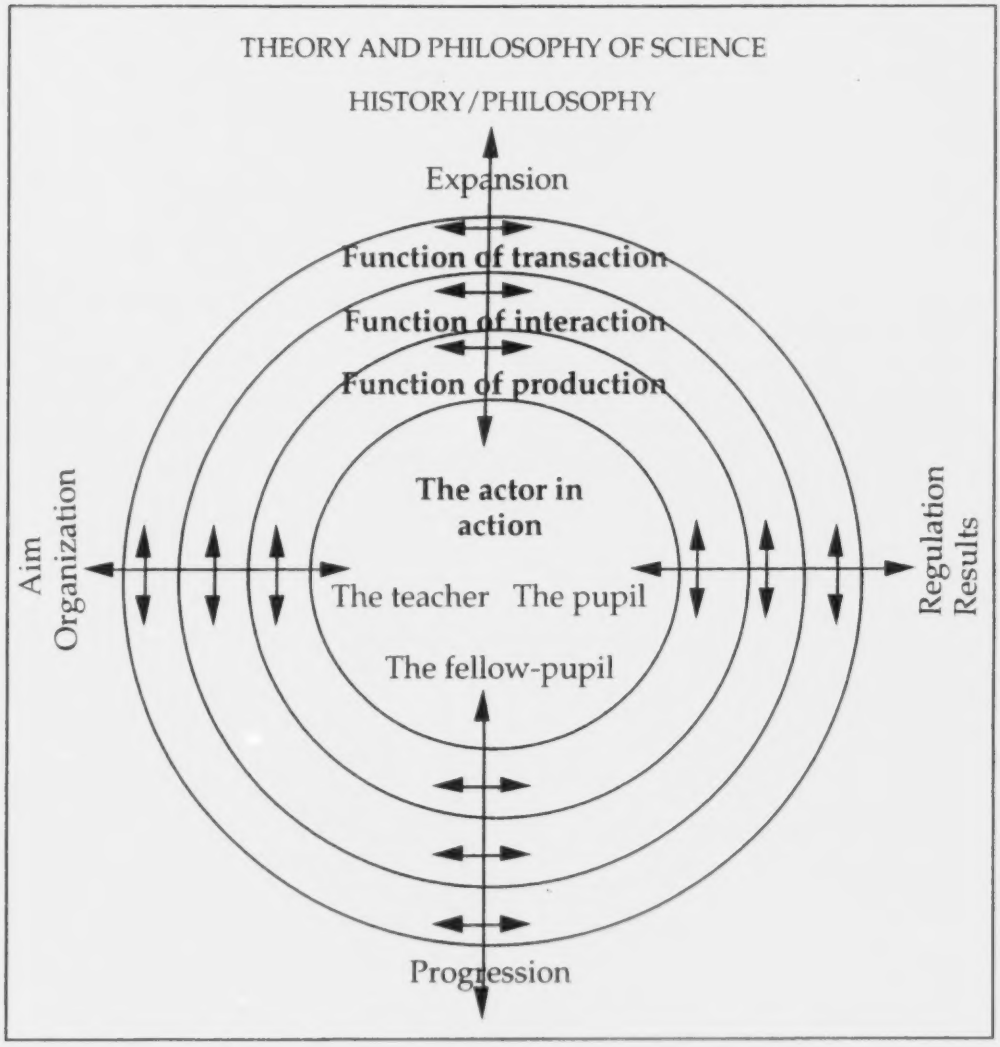

Figure 5.2:1.
The individual and the functions within the educative sloyd activity system (Lindfors, 1997, p. 46).

The world of social interaction includes social and communicative processes with educational content. This function is summarized in the expression *function of interaction.* The educative interaction often concerns factors within the sloyd work and the function of production, but several actors are involved, e.g. the teacher and a group of pupils, the teacher and one pupil, the pupil and a fellow-pupil.

The surroundings outside the workshop, and the entire school, constitute a surrounding environment including cultural phenomena, traditions, society-related factors such as technology, economy and politics which come into view in the curriculum and other steering instruments. This means that there is a transaction between the surrounding world and the other worlds within the holistic system. This function is summarized in the expression *function of transaction.*

The functions within the different worlds are going on in two directions, from inside the system to the envinronment, and in the opposite direction.

As mentioned in Section 5. 1. the subdisciplines within the different sloyd educational worlds as well as sloyd didactics (and the functions within these subdisciplines) also have to be studied from *a historical* and *a philosophical* angle. All these fields (the subdisciplines including sloyd didactics, sloyd history and sloyd philosophy) can in turn be objects of research within *the theory of science* and *the philosophy of science.* (Cf. Lindfors, 1990a, pp. 21–24). These levels within the science of sloyd education will be expressed as *overall planning, carrying out, analysing* or *evaluating perspectives.*

The theory presented in this section provides a dynamic-evolutional basis for focused aspects in applied research. Because sloyd educational research has to take into concideration ongoing processes (also when the research objects are described as static objects) some of the function areas in the theory could be applied in all examples in Appendix 2 as a focused perspective, in Studies VI and VIII as a frame of reference.

5.3. Dimensions of educative sloyd actions

As has been made clear before, actions in sloyd education consist of specific *sloyd actions* (psychical and physical processes) as well as interactionally conditioned *social and communicative processes.* Different areas of sloyd technological knowledge will be used in connection with sloyd actions, and the actions will end up as internal and external formative results. All these components within the educational sloyd process are illustrated in Figure 5.3:1. Social and communicative processes have not yet been studied within sloyd educational research. The specific sloyd actions in an educational context are divided into three dimensions in the actors/pupil's holistic organization:

1) modelling (in the inner world)
2) transforming (to the external world)
3) realizing (in materials)

The motive-result ideal has, however, also a material, work-related side, which is closely linked to the work object. The pupil has an ideal vision of the sloyd object during the whole process, and this vision merges with the real work object in hand and gradually with the concrete object (Sandelin, 1990, pp. 834, 841).

The conception the individual engaged in sloyd work has of his/her field of activity comprises different possibilities of realizing the motive-result ideal. As a matter of fact the possibilities are unlimited as long as the person producing the object is unconscious of the factors that limit the possibilities of choice. When awareness ensues, conception is transformed into imaginative and psychical activity and sloyd action. This takes us to the content of the sloyd activity itself (the internal and external sloyd actions). The description of the content of individual sloyd activities is based on theories of occupational psychology and trends of thinking about sloyd activity in connection with learning which have been dealt with in my earlier studies (Lindfors, 1991b, 1992b; see also Hacker, 1982; Leontjev, 1975; Pöyhönen, Teikari & Vartiainen, 1982; Vartiainen, Teikari & Pulkkis 1989).

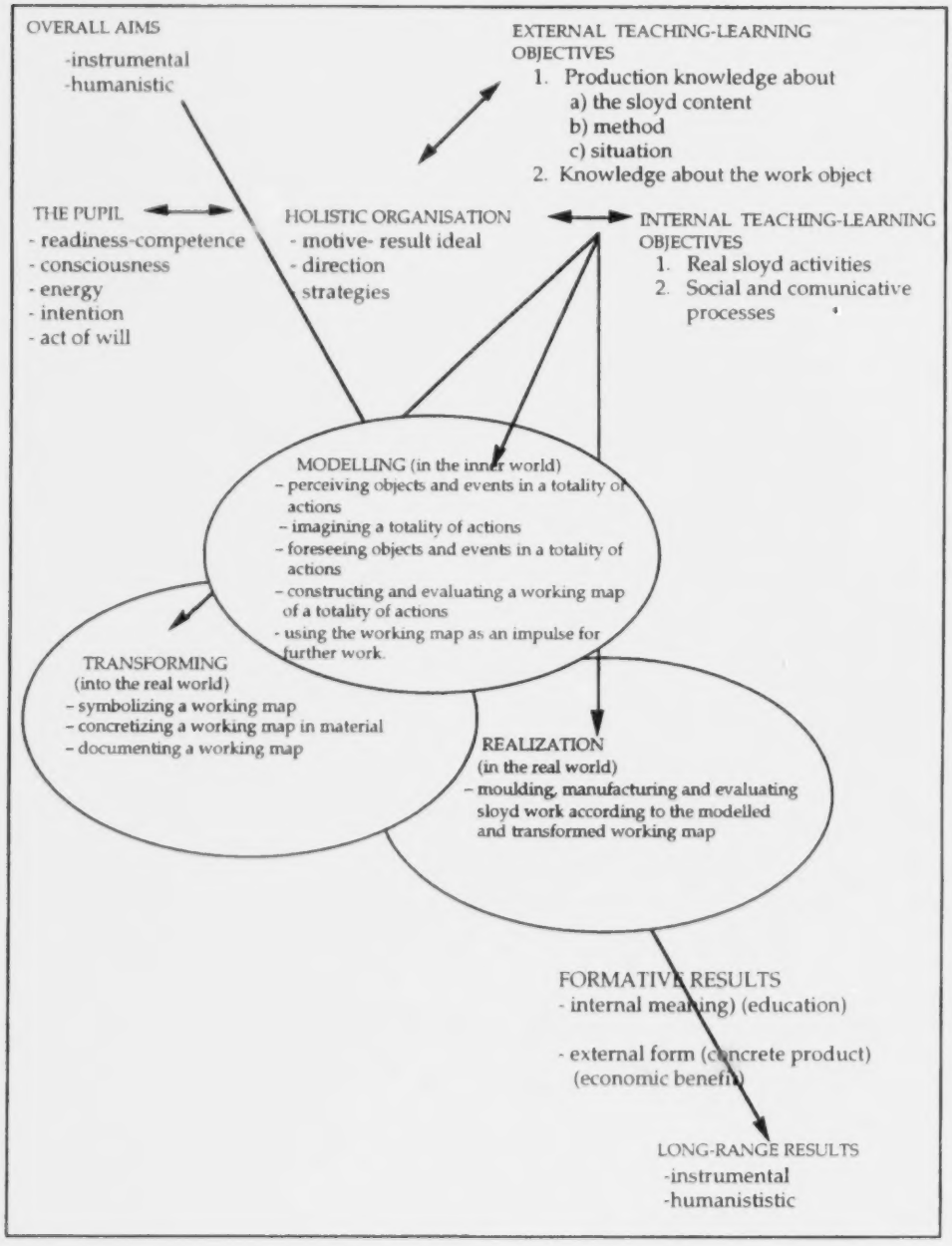
OVERALL AIMS
-instrumental
-humanistic
EXTERNAL TEACHING-LEARNING OBJECTIVES
1. Production knowledge about
a) the sloyd content
b) method
c) situation
2. Knowledge about the work object
THE PUPIL
- readiness-competence
- consciousness
- energy
- intention
- act of will
HOLISTIC ORGANISATION
- motive- result ideal
- direction
- strategies
INTERNAL TEACHING-LEARNING OBJECTIVES
1. Real sloyd activities
2. Social and comunicative processes
MODELLING (in the inner world)
– perceiving objects and events in a totality of actions
– imagining a totality of actions
– foreseeing objects and events in a totality of actions
– constructing and evaluating a working map of a totality of actions
- using the working map as an impulse for further work.
TRANSFORMING
(into the real world)
– symbolizing a working map
– concretizing a working map in material
– documenting a working map
REALIZATION
(in the real world)
– moulding, manufacturing and evaluating sloyd work according to the modelled and transformed working map
FORMATIVE RESULTS
- internal meaning) (education)
- external form (concrete product) (economic benefit)
LONG-RANGE RESULTS
-instrumental
-humanististic

Figure 5.3:1
Basic dimensions in sloyd actions in an educational context (Lindfors, 1992b, p. 116).

The first-mentioned dimension of organization, modelling, is of a psychical nature; it demands cognitive and affective engagement. The transforming dimension of organization demands engagement on all levels of the personality even if the focus lies on psychical actions. The realizing dimension engages all the levels of personality at the same time, but attention is then directed to physical actions, sensomotor directed work operations, in the concrete sloyd situation. Work operations, knowledge content, the social and communicative substance are psychically modelled in the inner world and are transformed as production realities in the real world in verbal (oral and written) form and as figures, pictures and two- or three-dimensional prototypes. Realization finally takes place in the real world, that is, in the concrete sloyd situation.

It is the concrete physical aspect of sloyd actions with its associated modelling and transforming processes that are specific to sloyd (technical as well as textile) and form the reason why these subjects demand other forms of teaching and learning than theoretical subjects like for instance history and geography, and interactive disciplines like for instance education and nursing. Sloyd is perceived to be *a transactional/productional* discipline (see below) characterised by holistically organized activity including the *interactive* adaptation of knowledge. Because of this orientation, the subject requires an adjusted form of didactics as has been pointed out by Peltonen (1988, pp. 105–106). Below, the three dimensions in sloyd actions, *which are going on simultaneously*, will be described in more detail. (Figure 5.3:1)

Modelling

- **perceiving** objects and events in a totality of actions
- **imagining** a totality of actions
- **foreseeing** objects and events in a totality of actions
- **constructing and evaluating a working map** of a totality of actions

---

In the modelling sloyd actions, the objects to be moulded/shaped are highly multifold and the actor must be able to mould with the aid of sense impressions and symbolized knowledge. Through direct sense impressions the actor receives figurative information of among other things the work object and the tools of the sloyd process and of the operative sloyd activity. Symbol-bound information and knowledge are available in the form of printed material and

through oral communication (Lindfors, 1987, pp. 119–121).
The modelling as well as the transforming and realizing content – what the sloyd actions are all about – can thus consist in either symbols, objects or events. For instance a picture of a stitch or a written work description forms symbol-bound content. Examples of objects are a fabric, a yarn ball or an iron. Events again are what goes on during the sloyd process, e.g. cutting fabrics or winding up yarn.

Modelling as *a dimension of sloyd actions* comprises the following psychical acts:

1) *Perceiving* symbols, objects and events in the sloyd environment;

2) *Imagining* on the basis of the message of the symbols (e.g. how parts of a garment are related to one another in a cutting-out design); the changes objects undergo in the course of work (e.g. the parts of the garment as cut out pieces and the course of events in the process (e.g. the effects of different hand grasps when cutting the fabric);

3) *Foreseeing* the messages of the symbols, the changes of objects and the course of events (e.g. what the effect of a part of a garment turned the wrong way in the cutting-out design will be; the changed structure of the piece of work when parts of the garment are cut out of the fabric and how cutting out has to be performed in the actual situation);
4) *Constructing a working map* on the basis of the actions in points 1–3 and in that situation taking into account the entire activity (e.g. the cutting-out of a garment);

5) *Evaluating the working map* through control, evaluation and choiceing of functions on the basis of the actions in points 1–3;

6) *Using the working map* as a stimulus to further work.

When completed, the working map is highly multifold (Figure 5.3:2). Besides the factors in the sloyd core which have been mentioned above, that is, motive-result ideals, production factors and work-object factors (the external teaching objectives) and the sloyd actions containing social processes and communication (the internal teaching objectives), situation-related aspects (situational factors in

the teaching process, for instance social considerations within the working team) and environment-related aspects (society related factors as well as cultural and natural surroundings) may be

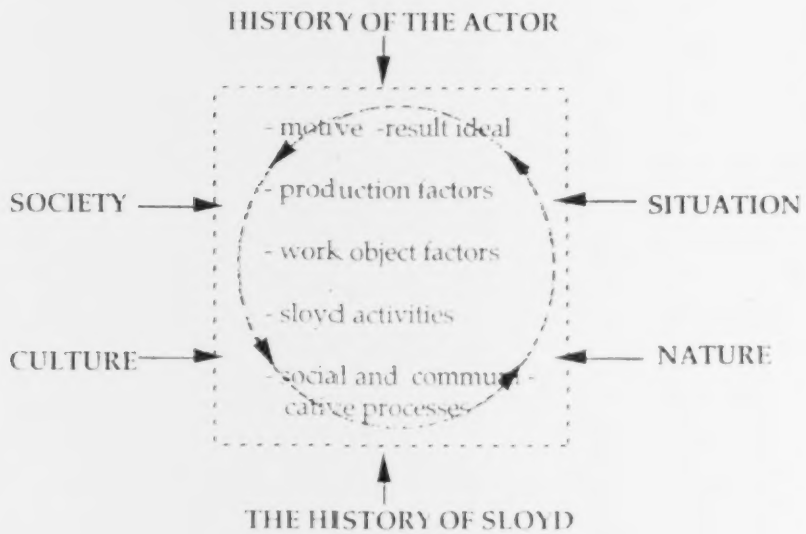

Figure 5.3:2.
Components of a completed working map. (Adapted from Lindfors, 1991b, p. 138.)

included. The working map can be further enlarged to include the personal history of the actor as well as historical factors connected with the sloyd subject itself.

The modelling is much to the fore during all the phases and steps of the sloyd process. This dimension of organization is affected by the evaluations of the actor performing the work and these in turn are linked to affective elements in the sloyd situation, the social situation and the personal history of the actor. On the basis of the outcome of the evaluations the actor regulates the whole activity system.

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Transforming

- **symbolizing** a working map
- **concretizing** a working map in material
- **documenting** a working map

The transforming of holistically organized sloyd actions involves a transformation from a perceived form (model) to the reality. After the working map has been elaborated and evaluated in the inner world, it gives impulses to *symbolize, concretize* and *document* sloyd actions. The working map can be symbolized orally, in writing or in figures, pictures and two- or three-dimensional prototypes. For example when the pupil explains to the teacher her/his suggestion for a garment model, it is a question of oral symbolizing. The symbolizing of the model can also be carried out by the pupil as a sketch of the modelled form and possibly as written information about the planned model. Above it was stated that concretizing can also take place directly as manufacturing. Symbolizing is a form of concretizing, that is re-forming of the modelled form into the real world.

Transformation implies that the model (in the inner world) gets a documented real form before the product is realized, that is, manufactured. The transforming thus contains linguistic, written, illustrating and sloyd-technological actions. The three last-mentioned are manual in character. The transforming actions are dominant during the final stage of the designing phase and during the phase of planning of manufacturing.

Realization

moulding, manufacturing and **evaluating** sloyd work according to the modelled and transformed working map

The realization finally comprises *moulding, manufacturing* and *evaluating* of the sloyd task and the sloyd object. This dimension of organization can also occur at different stages of the structural change process, but in the manufacturing phase this dimension of sloyd acting is naturally most to the fore. The realizing can, for example, consist in cutting out a garment as in the example above or in manufacturing the whole garment. The realizing organiza-

tional dimension activates all parts of the personality, but the senso-motor actions are particularly dominant when the work operations typical of the sloyd subject are being carried out. The last-mentioned circumstance is the reason why the transforming and the realizing have been separated. It could be thought that for instance language and other instrumental subjects in the school would not be served by such a division because the learning activities do not proceed further than to symbolizing.

5.4. Directions and strategies of educative sloyd actions

Organization of holistic sloyd activity proceeds from a motive-result ideal which serves as a motivating factor and as an ideal conception of product and process throughout the entire production. The motive-result ideal has been dealt with above.

From the description of external objectives it emerges that the knowledge content involved in the sloyd tasks is of a divergent character. The substantial content is made up of knowledge related to the production process, the work object and the method and situation processed within the sloyd actions (Chapter 6). The types of content demand different *directions* in the sloyd actions. The directions can be 1) interactional, 2) transactional or 3) productional in orientation depending on the work tasks that are focused on at the moment. The three directions of sloyd actions represent different manifestations of goal-related psychical and physical activities which the actor has to be conscious of.

The direction in its turn leads to different *strategies* (approaches) with regard to sloyd actions which end up as varying results, i. e. results of different types on different *result levels*. The strategy can be 1) rational, 2) relational or 3) tuning-in.

> *The directions and the strategies are mutually related so that the interactional direction is linked to rational strategy, the transactional direction to relational strategy and the productional direction to tuning-in strategy. These dimensions of sloyd actions are dealt with in pairs below.*

The relation between content, direction, strategy and the character and level of results are illustrated in Figure 5.4:1.

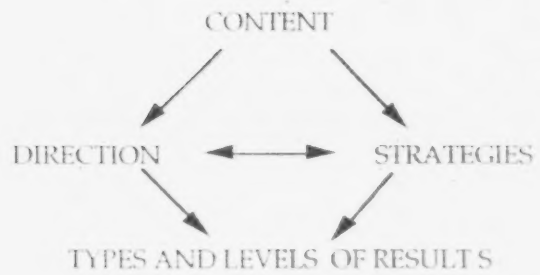

Figure 5.4:1.
The relation between content, direction, strategy and level of results of sloyd actions in holistically organized sloyd activity. (Modified from Lindfors, 1992b, p. 71.)

Direction and strategy have been adopted as terms for what could be called *basic forms* of sloyd actions. The strategies form the features of the direction with regard to the manner of approaching the work task. Both direction and strategy emerge from the character of the content, and the results are dependent on qualities of content as well as of direction and strategy.

An example of how the theory of dimensions of sloyd actions has been applied in research is to be found in Appendix 2, Study XI.

Theory of interactional direction
The theory of interactional direction of sloyd actions (and sloyd learning) has arisen on the basis of cognitive psychology, which has acquired a solid footing in the school system as far as studying and learning are concerned. This view is associated with learning theoretical subjects. Pupils are seen as moulders of knowledge, capable of setting up goals and objectives for themselves and steering their own activity towards the goals set up. Furthermore they have to be able to construct their own knowledge through active interaction between themselves and the surroundings and to acquire generalized internal models of hierarchically constructed units of activity. As a result of such learning, the pupils are expected to reach deep learning (Lahdes, 1986, pp. 131–135; Peltonen, 1988, p. 72; Lindfors, 1991b, pp. 78-79).

Since interactional studying and learning remain at the conceptual level, the strategy becomes *rational*. There is a separation between the acting individual and the topical situation. The activity is directed towards an objective "it", and the way of working is based on logic which is transformed into the real world in the shape of symbols compriseing quantified and structured knowledge. When interactional direction and rational strategy are applied in sloyd activity, the knowledge is also seen in the quality of the concrete product, but as objective qualities. The pupil gets knowledge about sloyd and learning which concerns *knowing what*. The dynamic-evolutional aspect of such activity expresses change. The pupil is changed by acquiring knowledge and skills and by learning to learn, but we see this from "outside" and we try to reach and judge the results objectively.

The interactional direction in combination with rational strategy is suitable for *acquiring knowledge in sloyd studies*. For instance different areas of knowledge contents (for instance "pure knowledge" about the consumer's justice), as well as knowledge of production, methods, situations and work objects, appear as objectives which can be taught interactionally-rationally.

It is above all the realizing of sloyd actions and the control of the situation variables that require more comprehensive directions and deeper-reaching strategies.

Theory of transactional direction

The theory of transactional direction in sloyd actions and learning has been estalished as a result of research in technical sloyd education (Peltonen, 1988, pp. 14–61, 72; Lindfors, 1991b, 82-87). This direction considers sloyd to have both a knowledge-based and a concrete teaching and learning purpose. According to this view, in sloyd teaching the pupil strives towards established goals and in addition towards goals/objectives (motive-result ideals, visions) that arise in the topical situation. The teaching and learning strategy is to be regarded as an alternating interpretation process through which the pupil is being taught to foresee and model production units, cope with production (transforming and realizing actions) and approve the product.

Transactionism focuses on the holistic organization of activity, paying attention to interaction with the surroundings and to the time dimension. It takes into account the personal history of the actor, his/her conscious intentions and acts of will, and it makes sure that all dimensions of personality are brought into play by sloyd activity and sloyd learning. The result is a product of production as well as a product of development – the education of the pupil.

The transactional direction in sloyd actions and sloyd studies requires a *relational* strategy. The production of products means that there exists a relationship between individual, object and events and an interpersonal relationship in the working environment. It is not possible to operate in the process of production and manufacture a product without cognitive, affective and evaluative consideration of relations between the process and the work object. Even sensomotor functions must be seen in relation to the actor, the work object and the various aids. Furthermore, there are social relationships and the relation to environmental factors. In each case it is a question of relations between a personal "I" and a personal "you", which can also consist of an object or an event. The principles of work emanate from emotions which interact with cognitions. The results will be expressed in qualitative terms, and qualitative properties are discovered in the material results as well as in the immaterial (formal) results of activity and learning. When pupils adopt a relational strategy, this concerns their *knowing how* different components interact with each other and with the environment. The development of the pupil is an educational quality. The sloyd process and the concrete sloyd product possess qualities which can be measured qualitatively because of the relations existing between the components of the system.

Theory of productional direction

The theory of productional direction has been established as a result of my research on sloyd education (Lindfors, 1991b, pp. 87-89). The contribution to the clarification of the construction of sloyd activity and sloyd learning consists first of all in the theoretical concepts of a motive-result ideal, the external content of knowledge and internal *teleonomic* sloyd thinking, acting and evaluating (a network of processes). The entire sloyd activity contains psychical and physical elements. The productional theory also explains factors like work

object, techniques, aids and results. The contribution of the systems theory consists in regarding the activity as a hierarchical system within which different components are interrelated in such a way that the system receives a structure characteristic of it. In addition to this, there is the dynamic-evolutional aspect, that is *fluctuation through functions*, a wave-like pattern between the systems at their respective system level, which changes relations and consequently the structure of a system. Systems at different levels affect each other through their functions, but not to the extent that they are wiped out as systems. It is, in other words, a question of interaction and transaction with the surroundings. Adjacent systems on lower and higher system levels constitute the surroundings of the systems. Information plays an important part in the relations and functions of the system.

When the theory of the productional direction is examined from the perspective of strategies, we find that it is, first of all, a question of overall organization, which starts from fluctuation. The fluctuation is started because of the instability that prevails within all the phases and steps in the sloyd process until the sloyd object is finished. By modelling, transforming and realizing sloyd actions which are intentional and at the same time developing, the actor's work is creating a new order in the system. In sloyd activity it is a question of giving meaning to the work since the sloyd process always has a motive-result ideal to start from and to strive for. In education it is a question of giving an educational meaning to the pupil's activity.

The holistic organization of sloyd actions results in a "we"-relation between the pupil (the actor) and the topical situation. It is, in other words, a question of a tuning-in strategy, and the results are expressed in terms of participation in this order of processes. This comprehensive engagement, activating all the dimensions of personality, gives the pupil knowledge which concerns *knowing where to*.

In the theory of the transactional direction, mention is made of *foreseeing* coming events, having a clear idea for instance of a mode of hand grasp before the sloyd action is carried out, knowing what the next step will be. In this theory the realization dimension in the sloyd actions is discussed as a reality.

The productionist theory implies that the actor is able to *know where to* he/she is aware of certain states in the process, the consequences of using different methods or materials in the production process. At least a skilful actor can calculate in advance what a designed garment will look like when it is finished.

According to Jantsch (1975, p. 95) all strategies (approaches) are necessary, they illuminate different aspects of human activities. The tuning-in strategy is necessary for realizing sloyd actions and in transforming sloyd actions which include work with concrete materials. Whenever an actor involved in sloyd works independently, and with all dimensions of personality involved, within a holistically organized system, the requirement is that the strategy is tuning-in. The actor doing the work should be fully engaged in order to make the activity proceed. Partial achievements, like certain conceptual, knowledge-bound tasks, social processes and communication can be dealt with by means of rational and relational strategy.

5.5. Formative results of educative sloyd actions and learning

Sloyd actions take place iteratively over time and the final result has an observable 1) physical shape (the concrete sloyd product) and 2) an inner meaning (a formative or immaterial result, among others education providing general working abilities, productional knowledge and skills). Formative results are achieved in the ongoing sloyd activity aimed at both external and internal objectives. Learning is a long-range result. Within research on sloyd education, taxonomies have been developed for the formative result dimensions (Lindfors, 1987, pp. 131-135; 1991a, pp. 86–89, pp. 166–169). In this study, formative results are due to objectives within the teaching-studying-learning situation. The quality of the educative situation is not dealt with explicitly, but naturally it affects the sloyd process indirectly. Taxonomies of motor skills achieved in school sloyd have not so far been developed in sloyd educational research, which explains the exclusion from this study of formative result qualities concerning work operations.

External knowledge-related results

External formative results reveal the quality of sloyd activity and learning as regards production knowledge (design-technological knowledge, knowledge of manufacturing, knowledge concerning methods and situations) and knowledge of work objects and overall areas of knowledge (e. g. consumers' knowledge, knowledge of sloyd traditions). The results can be ranged in a taxonomy which has been worked out for the purpose (Lindfors, 1991a, pp. 86–89, pp. 166–169; 1991b, pp. 149–153, 1992b, pp. 76-77). The following external result levels have been distinguished:

1) Units. The knowledge and information will be adapted as relatively independent entities in the pupil's sloyd actions which can be understood as "things". For example, the number 2 is a symbol unit and a stitch is a semantic unit. The content of the formative result is at this level strongly empirically anchored, that is, made conscious at a concrete level and connected with situational factors. The knowledge will be transformed into the real situation with the immediate help of the teacher.

2) Classes. The knowledge and information will be adapted in accordance with some general quality or principle in the pupil's sloyd actions, or the pupil is able to group the items of the content in question. For instance "birds" is a class of animals and stockinet(te) stitch is a class of sloyd technique. The knowledge is transformed and realized to a great extent with the help of the teacher.

3) Relations. The knowledge and information will be adapted in the pupil's sloyd actions so that the relations between units and the connections between units are clear to the pupil. A relation and a connection are more meaningful and easier to define, learn and remember than content as such. For instance, butter and bread become a sandwich, while combined knitted stitch in a particular way become ribbed knitting. The help of the teacher is only needed sporadically.

4) Systems. The knowledge and the information will be adapted in the pupil's sloyd actions in such a way that the assignment appears as a whole. The pupil masters whole systems and is able to insert necessary factors into the holistic system. For example, the grammatical rules of a specific field form a system, and a sock knitted according to definite technical rules also forms a system. These four result levels can be subordinated to each other.

Internal action-related results

The taxonomy of internal formative result levels has been developed for the evaluation of internal objectives – sloyd actions (Lindfors, 1991a, pp. 86–89, 166–169; 1991b, pp. 149–153, 1992b, pp. 77-78). In the description below there is a reference on each taxonomical level to the connection between the external and internal formative results. The taxonomy includes the following levels of internal formative results of sloyd learning:

1) The reproducing level. When sloyd actions including social processes and communication in connection with learning only contain units and possibly classes regarding the organization of knowledge and situational factors – it is a question of the reproducing level. For instance, if the pupil only knows knitting forwards and backwards without understanding the difference between plain and purl stitches and being able to model, transform and realize the assignment with reference to the relations between them and the whole, or if the work is done according to some models provided, it is a question of the reproducing level. At this level the pupil thus masters the content structure in the form of units and classes but is not capable of independently dealing with comprehensive production systems. The pupil does not master method and situational factors well enough. The achievement only comprises generalizations out of a few limited aspects separated from and independent of each other. The purpose is interactionally oriented and the knowledge is treated by rational strategy. The sloyd actions are performed with the help of the teacher.

2) The applied level. The applied level is reached when the sloyd actions include independent modelling and transforming with regard to relations and simpler systems. At this level the pupil is capable of realizing previously learned items in new situations (for example knitting a ribbing or a heel in socks of different sizes). The achievement only demands an interactionalistic effort with respect to knowledge organization and the knowledge is treated by rational strategy.

3) The reorganizing level. This level is reached when the pupil can model and transform previously acquired knowledge and skills in an "innovative" way (e.g. knit a different type of sock by varying stitches or by utilizing colour effects). A reorganizing level is reached when the whole, the system, is mastered with regard to

modelling as well as to transforming and realizing. The knowledge and the sloyd actions should thus reach the system level. It is not possible to achieve new solutions without being familiar with the transactional and productional approach within which relational and tuning-in strategy is adopted. The pupil's responses to the reorganizing level are characterized by his/her being able to organize familiar systems in a new manner so that new solutions are made possible.

4) The innovating level. When the sloyd actions result in unique models of solution from the pupil's point of view, it is a question of the innovative level. The pupil has to master complex systems with regard to modelling, transforming and realizing. At the level of innovation, unique products are developed and the requirement is that the pupil masters the field superbly so that he/she produces for instance a new type of socks for some special purpose, say, "after-sauna socks"). It is thus a question of creating quite new systems. The pupil can, in other words, in the sloyd activities in a tuning-in way organize a holistic information and knowledge mass, a formation of parts that are related to each other, are mutually interactive and have a transactional and productional relationship with one another.

Learning

In this study the term "result" is used to mean what the pupil retains from the process, the total meaning and profit of sloyd activity. The concrete result is a "sloyd product". The process yields both immediate results (formative results) and long-range results (more permanent learning). The concrete product – the sloyd article – is an integrated part of the process, something that remains. The product can be used as a source of knowledge at later stages, but it can be regarded as above all a material result. The result of the process is both material and formal (immaterial). The material side is constituted of the instrumental value of sloyd abilities from a purely utilitarian point of view, and the formal side of the instrumental value in terms of preparedness for action and as general education (Lindfors, 1987, pp. 51–52; 1991a, pp. 55–57; Peltonen, 1988, p. 81).

The long-range result – learning sloyd – consists in mastering sloyd as a system of activities comprising different areas of knowledge

and skills as well as social and communicative competence. Such results constitute instrumental educational values. Cultural alertness and integrity, individual development and therapeutic effects comprise humanistic educational values in fostering the pupil. These learning effects presuppose that the sloyd process is creative in character and transactionally/productionally oriented.

6. Knowledge areas within sloyd education

In my earlier research the specific sloyd educational knowledge has been divided into two areas, sloyd technological-aesthetic knowledge and overall knowledge. The first-mentioned form of knowledge has furthermore been divided into two areas, i. e. knowledge concerning the sloyd production and knowledge concerning the work object. These research results are summarized in a Figure in Appendix 1, where also sloyd actions and formative results are presented. The knowledge areas which I call external goals are created from the goal descriptions in the curricula, but the sloyd educational theory has been taken into consideration. The sloyd actions I call internal goals; they are steered by the intention in the curricula and by the pupils' motive-result ideal. In this chapter I intend to present the theory of sloyd educational knowledge areas briefly (Figure 6:1). (Lindfors, 1991b, pp. 108-113, 1992b, pp. 25-28).

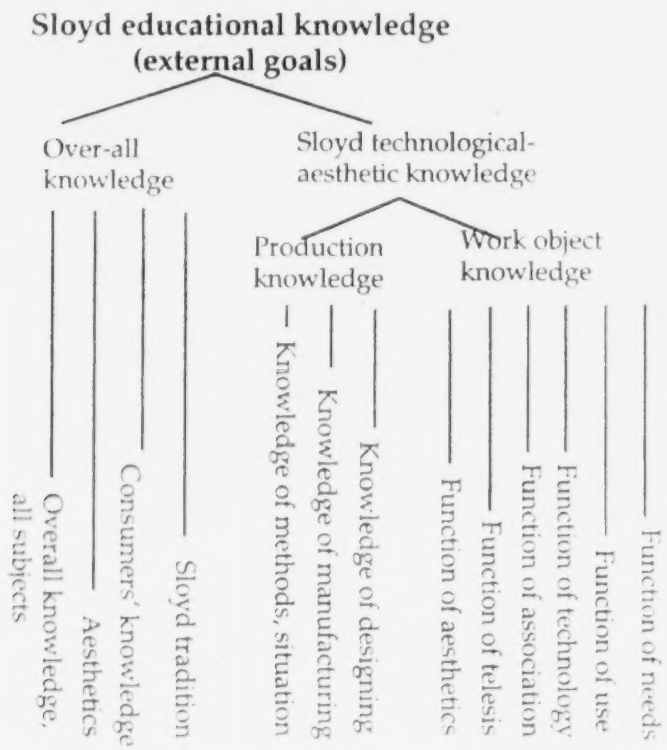

Figure 6:1.
Knowledge areas in sloyd education. (Modified from Lindfors, 1992b, p. 27.)

The sloyd actions and the formative results have been presented as theories above; this dynamic-evolutional form of goals is not to be found in the curricula.

6.1. Knowledge related to sloyd production

In the sloyd educational research concerning knowledge areas, the *phases* of the production within the sloyd process (Chapter 7) have been taken into consideration as well as the holistic working situation. The knowledge areas are:

- knowledge of designing technology,
- knowledge of manufacturing technology and
- knowledge of methods and the working situation.

Within the phases of the educative sloyd process the knowledge areas are divided in the following way:

- *the phase of designing:* knowledge of designing technology, knowledge of manufacturing technology and knowledge of methods and the working situation;

- *the phase of planning of manufacturing:* knowledge of manufacturing technology and knowledge of methods and the working situation;

- *the phase of manufacturing:* knowledge of manufacturing technology and knowledge of methods and the working situation.

The knowledge of designing technology is of course related to the phase of designing, but the knowledge of manufacturing technology in various sloyd areas concerns the phase of planning of manufacturing as well as the phase of manufacturing, i. e. the *traditional sloyd technology* (the substance of sloyd work itself). The phase of designing demands a special form of knowledge, designing technology, and also knowledge of manufacturing technology. The designer has to have knowledge concerning the entire production process to be able to carry out a functional design. Knowledge concerning the methods and the working situation is needed during the entire sloyd process (Lindfors, 1992b, pp. 28-29).

Knowledge of designing technology
As mentioned above, the knowledge of designing sloyd products concerns all forms of knowledge – knowledge of designing, knowledge of manufacturing and knowledge of the methods and the working situation. The first mentioned concerns on one hand sloyd technological knowledge of techniques, materials, tools etc. needed for the designing proper and on the other hand for the documentation of the design, that is, the knowledge areas concern illustrational (graphic) documentation, drafts or sketches often with test pieces of actual materials (Lindfors, 1992b, pp. 29-30).

Knowledge of manufacturing technology
Knowledge of the manufacturing technology includes different technical sloyd areas, e. g. wood work, metal work, work with engines and work in the field of electricity, and textile sloyd areas, e.g. clothing, sewing, needlework, weaving, knitting. The most important content in this area is knowledge of techniques, i. e. rules concerning knitting and wood work, and relationships between techniques, materials and tools. Techniques concerning technical drawing and making patterns will be actualiced especially during the phase of planning of manufacturing.

In connection with all these areas, familiarity with various materials (e. g. fabrics and wooden materials), equipment, factual aids (patterns, technical drawings), operative aids (tools and machines) will be actualized during all phases of the sloyd process. (Lindfors, 1992b, p. 31).

Knowledge of methods and the working situation
The concept of method embraces both the concept of technology and the concept of technique. Method is defined as "the way to carry out the work" or "the way to solve a task". Different methods have to be used in dynamic-evolutional production situations where the pupil has to have or to create knowledge about how to work – *know how* concerning design, planning of manufacturing and manufacturing as well as the actual working situation. The methods are in fact the technology-related part of the *strategy* of realization, which ends up on some level of formative results (Section 5.5.). The chosen method depends on the task (a knowledge task or some operation in the production process), and the level of

the pupil's preparedness. A knowledge task could perhaps be carried out using a rational strategy, a productional task possibly needs a tuning-in strategy.

Sloyd work usually requires a specific workshop where several persons/pupils are working together. Depending on the task, a specific working situation has to be created. The pupil has to have some knowledge concerning different *functions* in this situation, that is, functions of production, interaction and transaction (Section 5.2). On an overall level the pupil also has to be familiar with the phases and steps of the sloyd process; he/she has to know how the process will proceed from designing to planning of manufacturing and manufacturing, and what form and level of knowledge and skills are needed (Lindfors, 1992b, pp. 31-33).

6.2. Knowledge related to the work object

In my research concerning knowledge related to the work object a theory created by V. Papaneck (1973) has been used. He stated that the function of a product is a totality including six subfunctions – the needs, the use, the technology, aesthetics, association and telesis[1] (Figure 6.2:1).

The subordinate functions represent both material (concrete functional) qualities and immaterial (symbolic) qualities. The first group includes the needs, the use and the technology, and the second aesthetics, association and telesis.

Interaction with the surroundings, the natural as well as the cultural, is essential for the functions of a sloyd product. For instance a clothing designer needs knowledge concerning the climate, human physiology and psychology, and sociocultural aspects within the surroundings. During the phase of designing, the

[1]In a later publication of Papanek's (1995), the criterion of telesis has been changed to consequences – ecological-environmental, social-societal, material and energy use. My theories are created on the basis of his earlier book. Furthermore, in my model I use the concept of technology instead of Papanek's concept of method. Techniques, working methods, tools and materials are superordinated to the concept of technology, but not to the concept of method in my definition of the concepts. (See the definitions of main terms in this report.)

pupil has to carry out a function analysis in connection with educative criteria within the sloyd process (Lindfors, 1992b, pp. 33-37). (Section 7.4).

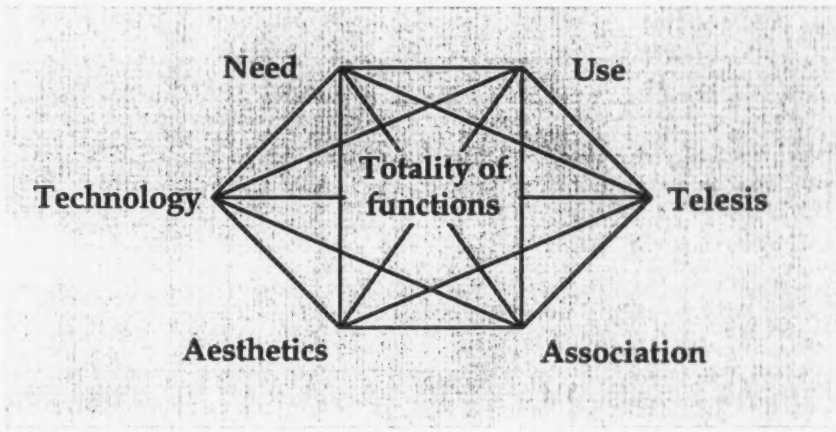

Figure 6.2:1.
The functional totality of a sloyd product. (Modified from Papanek, 1973, p. 25; Lindfors, 1992b, p. 34.)

Knowledge concerning the *function of needs* could be found in physiological, psychological, sociocultural and fashion-related areas. This function criterion is also connected with economic and consumer aspects. Because the area is extremely comprehensive, the pupil's function analysis has to be limited to practice-related aspects and actual goals in the curriculum.

The usefulness of a sloyd product is an answer to the criterion *function of use*. In this area the pupil's experiences have to be taken into consideration. The pupil is the producer and mostly also the consumer. The knowledge in this area concerns qualities connected with the area of application, various situations where the product could be used, the service of the product, and laws and regulations concerning producer as well as consumer aspects.

The *function of technology* concerns techniques, working methods, tools and materials superordinated to the concept of technology. All these criteria have to interact within the production process and of course when the product is in use. The pupil therefore needs manufacturing knowledge even during the phase of designing.
The sloyd product could also have some associative effects on the

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user. The *function of association* concerns physiological qualities (e.g. a feeling of warmth), psychological qualities (e.g. the owner's character) and sociocultural qualities (e.g. fashion, ethical codes). Not all products have found their correct association criteria. For instance the TV set was simply an article of furniture before it became a set for receiving television broadcasts.

Knowledge about the *function of telesis* has to do with the spirit or atmosphere of the epoch which could be used as a criterion within the totality of functions. According to Papanek (1973, p. 32) a product has to express its own epoch and culture as well as the circumstances connected with its coming into being. Lack of the telesis function can be noticed for instance when a product is not suitable for one's life style, e.g. an old-fashioned house to be used by modern people.

The *function of aesthetics* is an overall aspect within the functional entirety. The aesthetic domain (of knowledge) is very comprehensive and multifold. It includes visual aspects (e.g. colour, form, rhythm, harmony), technology-related aspects (e.g. choice of material and manufacturing techniques) and, furthermore, qualities to be emphasized (e. g. lightness, massiveness, proportions). The product has to give an impression of elegance, grounded in precision and simplicity within all other criteria concerning the functional entirety (Lindfors, 1992b, pp. 33-47; Cf. Anttila, 1993.).

An example of how the theory of knowledge related to the work object has been applied in researsh is to be found in Appendix 2, Study XII.

6.3. Overall knowledge areas

Knowledge areas which do not directly belong to the sloyd substance will be briefly presented in this section. The so-called overall knowledge areas concern the sloyd tradition, sloyd-related consumer knowledge, aesthetics and a variety of areas which have to be included in all subjects at the comprehensive school. The last-mentioned knowledge area includes e.g. education concerning health, the family, equality, human relationships, internationalism, and massmedia. Consumer knowledge can also be included in this area.

The knowledge area concerning the sloyd tradition is also comprehensive and multifold; knowledge related to social and vocational culture belongs to the area. For instance the history of clothing as well as the history of interior decoration belong to social culture, and traditions concerning sloyd technology and manual work belong to vocational culture.

With regard to the educative sloyd process, overall knowledge has to be integrated into the sloyd technological knowledge presented above. Especially during the phase of designing overall knowledge is needed (Lindfors, 1992b, pp. 47-61).

7. The pupil's educative sloyd process; applying the theories in education

7.1. The dynamic-evolutional way of thinking

In the Introduction (Chapter 1) I mentioned that the starting-point for my research was a dynamic-evolutional way of thinking of sloyd activity in an educative context. The educative sloyd activity has to be conceptualized as an ongoing holistic human process where the actor (the pupil, the teacher or the fellow-pupil) is acting within the sloyd activity itself, and which includes the function of production in relation to the function of social interaction and the function of transaction (Section 5.2). Furthermore, I stated that the theories have to be used as instruments for understanding and structuring the sloyd educational field in the curriculum and syllabus as well as in studies and research.

Because the theories are *general* in nature, their reality-related form will be constituted in a context; the planning and teaching-studying are connected with various educational areas and levels of the educational system (Chapter 3). The purpose of this section is to suggest how the individual theories could be understood and used in an applied educative sloyd process *from the pupil's point of view*, that is, teaching aspects are not taken into consideration. The description is extremely brief and concerned with the general (allround) education (Lindfors, 1990b, 1991a, pp. 43-44).

7.2. The experienced educative sloyd process and the normative steering system

The educative sloyd process is intentional because it is steered by goals in the curricula/syllabus plans. In the ongoing teaching-studying-learning process, the goals will appear as objectives to be taught and studied and, hopefully, learned. There will be various types of teaching-studying-learning situations – interactions – during a sloyd lesson. The teacher interacts with the entire group, with an individual pupil or with a group of pupils simultaneously. A fundamental idea in the systems theory for the pupil's educative sloyd process is that the teacher, the pupil and the components of the educational situation should form a system of interaction (Figure 7.2:1, see also Chapter 4). The pupil should also work alone during some part of the lesson.

The systems theory of the experienced educative sloyd process is divided into the following subsystems: (1) the teacher and the pupil as superordinate individual systems, which are often interacting, (2) the steering system (goals, methods, aids etc.), and the subject matter including such situational factors in the actual teaching-studying-learning situation as appear as objectives and end up in formative results, (3) the result system (the final results of the entire sloyd process), (4) the system of phases and steps of the experienced sloyd process – the teaching-studying learning flow or, if the pupil works alone, the studying-learning flow.

The pupil's sloyd process is described as a slowly progressing process of structural change, divided into phases and steps. Within each step, sloyd actions, including modelling, transforming and realization activities are going on. Depending on the content, the sloyd actions need different directions, which in turn require different strategies and lead to different formative results. (Sections 5.3., 5.4. and 5.5). The slow change in the structure of the work on the object to be produced, with its accompanying cognitive content, proceeds from 1) designing to 2) planning of manufacturing and to 3) manufacturing – a production process in sloyd materials (Lindfors, 1991a, pp. 70-74).

The educative sloyd process starts with the teacher's primary planning of the entire teaching-studying-learning process, followed by the planning of the area of interest (a larger working area including various sloyd actions and different forms of knowledge – a wider sloyd activity system) or a larger project, together with the pupils. The entire activity ends up with the teacher's evaluation of the entire teaching-studying-learning process, and the teacher's and the pupils' common evaluation of the area of interest. All in all, eighteen steps have been identified, eight of them within the design phase, six within the phase of planning of manufacturing and four within the phase of manufacturing. (Figure 7.2:1.) In sloyd educational research the phase of designing has been studied and evaluated in more detail. The theory concerning the phase of planning of manufacturing and the phase of manufacturing is therefore hypothetical, partly grounded on the author's studies in the field, partly on practical experiences of sloyd work in various educational contexts (Cf. Lindfors, 1991a, pp. 89-91).

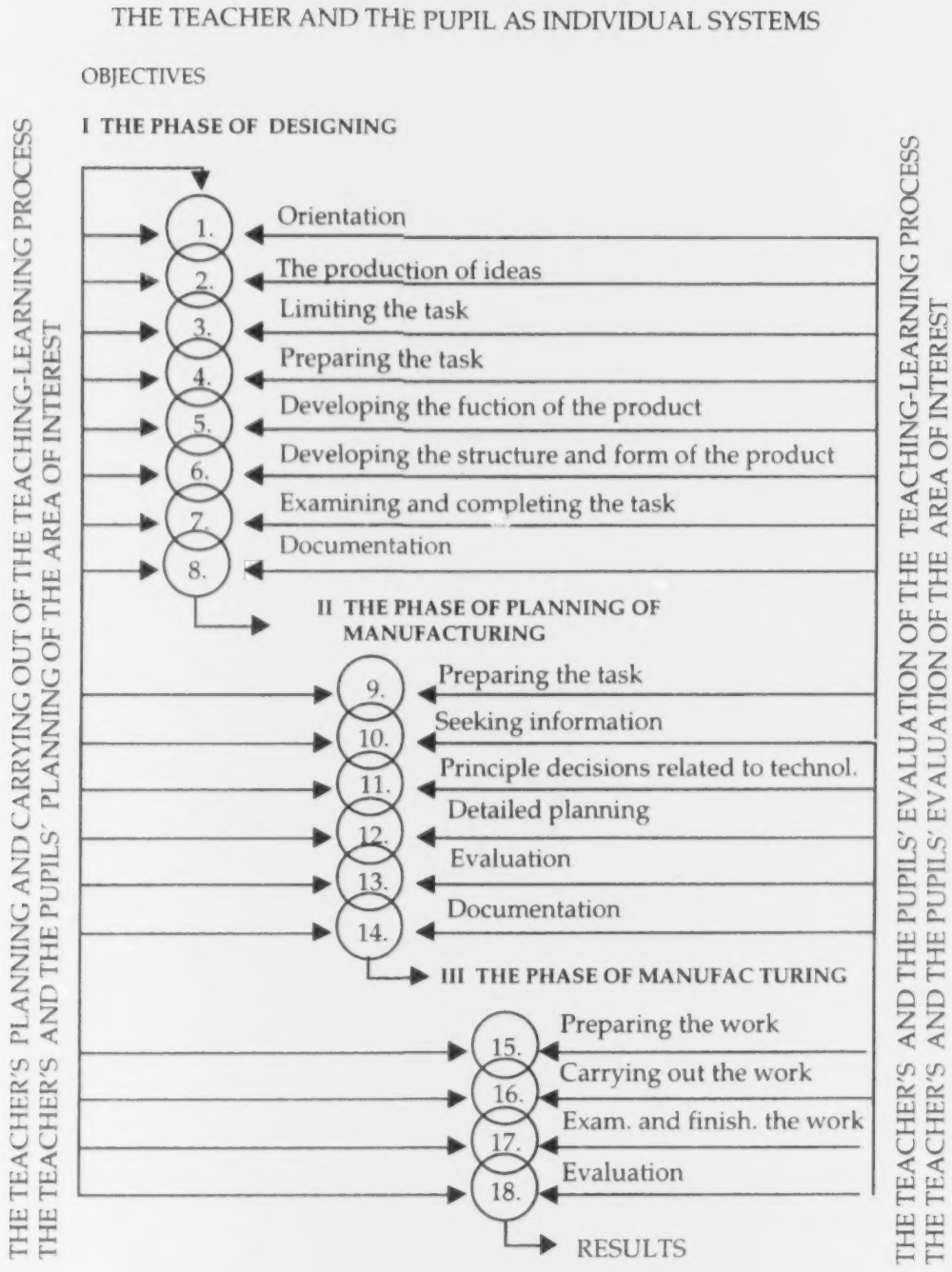
THE TEACHER AND THE PUPIL AS INDIVIDUAL SYSTEMS
OBJECTIVES
I THE PHASE OF DESIGNING
1. Orientation
2. The production of ideas
3. Limiting the task
4. Preparing the task
5. Developing the fuction of the product
6. Developing the structure and form of the product
7. Examining and completing the task
8. Documentation
II THE PHASE OF PLANNING OF MANUFACTURING
9. Preparing the task
10. Seeking information
11. Principle decisions related to technol.
12. Detailed planning
13. Evaluation
14. Documentation
III THE PHASE OF MANUFAC TURING
15. Preparing the work
16. Carrying out the work
17. Exam. and finish. the work
18. Evaluation
RESULTS
THE TEACHER'S PLANNING AND CARRYING OUT OF THE TEACHING-LEARNING PROCESS
THE TEACHER'S AND THE PUPILS' PLANNING OF THE AREA OF INTEREST
THE TEACHER'S AND THE PUPILS' EVALUATION OF THE TEACHING-LEARNING PROCESS
THE TEACHER'S AND THE PUPILS' EVALUATION OF THE AREA OF INTEREST

Figure 7.2:1.
A systems theory of phases and steps in the pupil's educative sloyd process. (Modified from Lindfors, 1991a, p. 90.)

As I mentioned earlier, only the pupil's sloyd actions, including different kinds of knowledge, will be described below, not the teacher's part in the work. The systems theory has to be used as a *theoretical orientation* for planning, teaching-studying and evaluating within an area of interest or a larger project, steered by the goals in the curricula and the motive-result ideal of the pupil. The intention is to give a sytematized ground for the activities, not to restrict the actors by rigidity. There has to be "degrees of freedom" in sloyd work.

In an experienced situation the steps will overlap and perhaps be *iterative*, i. e. go backwards and then forwards again.

7.3. Perspectives of description

The description of an experienced educative sloyd process is universal in nature, and possibly iteration between the steps has not been taken into consideration. The descriptive perspectives within the steps in question are:

- Motive-result ideal,
- External knowledge, external goals;
  - knowledge of designing technology,
  - knowledge of manufacturing technology,
  - knowledge of methods and the working situation,
  - knowledge related to the work object,
  - overall knowledge,
- External formative result, expected levels:
  - units,
  - classes,
  - relations,
  - systems,
- Sloyd actions, internal objectives:
  - modelling,
  - transforming,
  - realization,
- Directions in sloyd actions:
  - Interactional direction,
  - Transactional direction,
  - Productional direction,

- Strategies in sloyd actions:
  - rational,
  - relational,
  - tuning in,
- Internal formative result, expected levels:
  - reproducing,
  - applying,
  - reorganizing,
  - innovating,
- The results of the work and study during the entire step.

The descriptive perspectives have been presented in my earlier research reports in more detail (Lindfors, 1991a, 1992b). The phases and steps in the pupil's sloyd process can be identified within the teaching-studying-learning process as a limited, single work object, or as mentioned above, connected with an area of interest or a larger project. The following description concerns the pupil's sloyd process within an area of interest. The description is theoretical by nature, for instance the formative result can only be estimated as expected levels.

7.4. The phase of designing

(1) *Orientation.* The motive-result ideal to be reached during the first step of the designing phase is an integration of the goals in the syllabus and the pupil's individual needs and wishes. The pupil has on the unit level of formative results to perceive and be familiar with the area of interest, different forms of knowledge concerning the work object – the wanted sloyd product, and knowledge related to the production process, to *know what* and *know how*. The pupil has to foresee, be aware of, which skills will be needed in the process on the reproducing level of formative results. The directions of the sloyd actions within this step are transactional and the strategies relational, because the pupil has to take into consideration the goals, combined with the individual motive-result ideal. The result of the entire step is an unstructured, limited working map in the pupil's mind concerning the area of interest.

(2) *The production of ideas.* During this step the pupil's wishes to enrich her/his own knowledge and to be conscious of all knowledge areas related to the area of interest. The pupil has on the unit or

class level of formative results to be able to imagine how the sloyd product could be more interesting and valuable according to e.g. sloyd traditions, aesthetics and in relation to consumer aspects, to *know what*. The pupil's individual learning could expand during this step, which means that the modelling sloyd actions have to reach the reorganizing level of formative results. The sloyd actions within this step are transactional and the strategies relational; the pupil still has to take into consideration the goals, combined with the individual motive-result ideal, to *know how*. The result of the entire step is still an unstructured, but enriched, working map in the pupil's mind.

(3) *Limiting the task.* During this step the pupil has to get a firmer grasp of the work task. The motive-result ideal is the sloyd product (on an abstract level) and the pupil's wish to enrich his/her own proficiency, to acquire the necessary knowledge about the work object and especially the techniques needed in the phases of design and manufacturing. It is important that the knowledge has to reach the reorganizing level of formative results. The sloyd actions are directed to foreseeing objects and events in a totality of actions and to limiting the task. This means that the pupil has to take into consideration for instance individual abilities, economic resources and conditions in the environment, e. g. tools and machines. The sloyd actions within this step are both interactional and transactional and the strategies rational or relational. The pupil has both to *know what* in a rational way and to acquire *knowing how* and thereby to think relationally. He/she has to take into consideration the goals, combined with the individual motive-result ideal. The results of the entire step is a structured but superficial working map in the pupil's mind.

(4) *Preparing the task.* The motive-result ideal during this step is the pupil's foreseeing, wishing to learn more about the area of interest, to acquire skills and find knowledge about the individual production process, design technology and manufacturing technology as well as overall knowledge and knowledge concerning the work object. At this stage, knowledge of designing is necessary on the relation level of formative results. The pupil has to construct a working map for the design-work, which means that the sloyd actions have to reach the level of applied formative results. The sloyd actions within this step are both transactional and productional, and the strategies are therefore both relational and tuning in. The pupil has to *know how*

and *know where to*; to take into consideration the entire sloyd activity, steered by goals, and the individual motive-result ideal. The results of the entire step is a structured, enriched working map in the pupil's mind.

(5) *Developing the function of the product.* The motive-result ideal during this step is the sloyd product (in the pupil's mind), within the area of interest, and the intention to enrich the pupil's own proficiency. The specific design work will start during this step. The pupil has to symbolize the working map, search for specified knowledge of designing with regard to the function of the sloyd product, i. e. criteria of needs and use, and technical solutions connected with the criteria have to be fulfilled. The pupil's knowledge of designing has to be enriched and knowledge of manufacturing has preliminarily to be taken into consideration during this step. Besides, the knowledge has to be on the systems level of formative results; the pupil has to have holistic knowledge of the work object – the sloyd product – and he/she has to be familiar with the entire area of interest. This means that the sloyd actions include imagining, foreseeing the objects and events in their totality and, furthermore, symbolizing in order to transform the design in the real world. The formative results have therefore to be on the reorganizing or innovating level. The directions of the sloyd actions within this step are both transactional and productional, and the strategies relational as well as tuning in. The pupil has to *know how* and *know where to*; to take into consideration the entire sloyd activity, steered by goals and the individual motive-result ideal. The results of the entire step is a structured and transformed working map concerning the function of the product.

(6) *Developing the structure and form of the product.* The motive-result ideal during this step is still the sloyd product (in the pupil's mind) within the area of interest, and the intention to enrich the pupil's individual proficiency. This step is the second one which presupposes specific knowledge of designing. The pupil has to search for different forms of knowledge of the structure and the form of the product on the systems level of formative results. Also during this step the pupil has to have holistic knowledge about the sloyd product and to be familiar with the entire area of interest. The sloyd actions have to be imagined and foreseen in relation to the transformation processes. Symbolizing the working map in texts and sketches or orally are documenting actions at this stage.

Sometimes it is necessary to test the design by making a prototype in the materials in question. The work demands reorganizing and innovating actions, both transactional and productional in nature, which means that the strategies are relational as well as tuning in. The pupil has to *know how* and *know where to;* to take into consideration the entire sloyd activity, steered by goals and the individual motive-result ideal. The results of the entire step is a structured and transformed working map for the structure and form of the product.

(7) *Examining and completing the task.* The pupil's motive-result ideal during this step is to be sure that the product design will work, be realizable. According to the intent of the curriculum and the pupil's wishes and needs, the examination is a value analysis on the systems level of formative results. At this stage the examination is more or less abstract, imaginative; the teacher and the pupil have to examine all the previous steps, i.e. the goals of the area of interest and all forms of knowledge used during the phase of designing. The sloyd actions then concern imagination and foreseeing on the applied, reorganizing or innovating level of formative results during the previous steps. The sloyd actions within this step are interactional as well as transactional and productional. The strategies are consequently rational as well as relational and tuning in. The pupil has to examine *know what, know how* and *know where to;* i.e. to take into consideration the entire sloyd activity so far, steered by goals and the individual motive-result ideal. The results of the entire step is an examined, structured working map; the pupil has to summarize and to be conscious of what the phase of designing includes.

(8) *Documentation.* The motive-result ideal during this final step of the phase of designing concerns the product design itself and the pupil's intention to attain ability for this kind of work. The pupil has to have knowledge about how to do documentations in the sloyd subject on the systems level and he/she also has to be able to work in practice on the applied level. The sloyd actions within this step are transactional and the strategies relational. The pupil has to *know how* to carry out the documentation work. The results of the entire step is a product design, involving the imagined and documented working map, and the fulfilled intention to learn about design work.

7.5. The phase of planning of manufacturing

(9) *Preparing the task*. The motive-result ideal during this first step of planning of manufacturing is the pupil's intention to learn how the product design could be realized in the materials in question, and of course to arrange the planning work in such a way that the product will be like the designed one. The pupil has to take into consideration the entire area of interest and to seek for the necessary knowledge of manufacturing on an applied level of formative results. The sloyd actions therefore include seeking for books and directions, and among other things tools and machines, i.e. knowledge of methods and the working situation. Organizational work has to be done in practice. The sloyd actions within this step are both interactional and transactional and the strategies therefore rational as well as relational. The pupil has to *know what* is needed for the entire work situation, and to *know how* to carry out the documented design in practice. The results of the entire step is a structured working situation, which means a meaningful start for the planning of manufacturing.

(10) *Seeking information*. The motive-result ideal within this step is that the pupil will learn to do theoretical work in connection with sloyd work, and to conceptualize it as a meaningful task. The theoretical knowledge is mostly of a technological nature (knowledge of manufacturing) which could be found e.g. in factual books, magazines and machine directions. Also for instance patterns and technical drawings can be used as theoretical information. Overall knowledge areas needed during this step are for instance knowledge of sloyd traditions and consumers' knowledge connected with the area of interest. The knowledge has to be applied on a relational or systems level of formative results. The pupil's sloyd actions concern searching for and picking up necessary knowledge needed for the task, which represents the results of the entire step. The sloyd actions within this step are in other words much like those in the preceding step.

(11) *Principal decisions related to technology*. During this step the pupil's motive-result ideal is to learn how to make the necessary technical decisions concerning the sloyd product within the actual area of interest. This means that the pupil has to study and acquire actual knowledge on a relational or systems level of formative results, and to structure, control and evaluate the knowledge, and

finally find technological solutions concerning the realization of the product design, the manufacturing. The sloyd actions comprise all directions and strategies and the pupils' work has all in all to be on a reorganizing or innovating level of formative results. The pupil has to *know what* and *know how* and *know where to* in relation to the task and the entire area of interest. The results of the entire step is a more or less abstract working map concerning technological solutions.

(12) *Detailed planning*. During this step the productional, manual work finally starts. The pupil's motive-result ideal concerns how to carry out the designing and the planning of manufacturing in practice. He/she has at this stage to have knowledge of manufacturing, including aesthetical insights as well as of methods and the working situation, that is, of operative aids and machines. The pupil has to test different techniques in materials, make e.g. patterns, technical drawings or prototypes, and to write work descriptions. In other words, the pupil's knowledge has to reach the relational or systems level of formative results and the nature of the work demands that the pupil's actions at least have to be on an applied or reorganizing level of formative results. This means that the actions are transactional/productional in nature and the strategies relational/tuning in. The pupil has to *know how* and *know where to* in relation to the task and the entire area of interest, to reach the reorganizing or innovating level of formative results. The concrete results of the entire step are concrete patterns, drawings, test pieces and work descriptions.

(13) *Evaluation*. The pupil's motive-result ideal during this step is to evaluate the earlier steps of the planning of the manufacturing phase. The evaluation concerns therefore all the knowledge areas which have been actualised. Actual sloyd actions are searching, controlling and evaluating on a systems level, like the actions in the evaluation step during the designing phase. The sloyd actions within this step are interactional, transactional and productional, and the strategies consequently rational, relational or tuning in. The pupil has to examine *know what, know how* and *know where to* in relation to the task and the entire area of interest. The results of the entire step is how the work during the phase has succeeded in relation to the design and the entire area of interest.

(14) *Documentation*. This step includes the final work within the phase of planning of manufacturing. The motive-result ideal is to get a realistic manufacturing plan; to finish the concrete plan. The pupil has to have knowledge about how to carry out technical documentation on the systems level and he/she has to be able to work in practice on the applied level. This means that the sloyd actions are transactional and the strategies relational, to *know how* concerning technological documentation. The results of the entire step is a manufacturing plan, and a fulfilled intention to learn about manufacturing work.

7.6. The phase of manufacturing

(15) *Preparing the work*. During the two earlier phases the pupil's sloyd work within an area of interest has been designed and the manufacturing planned. The motive-result ideal during this step is therefore to form an appropriate working situation. New areas could be for instance deeper knowledge of methods and the working situation, that is *know what* on the relations level of formative results concerning actual operative aids and machines which have to be used in the production process, and about materials for the sloyd product. The sloyd actions have to be transactional and the strategies relational on a reorganizing level, the pupil has to manage the whole working situation in relation to the plan of manufacturing. The result of the entire step is an appropriate working situation.

(16) *Carrying out the work*. The specific manufacturing is finally the motive-result ideal for the pupil's sloyd actions. This step includes in the experienced situation a very large area of activity – especially the manual work operations are a very large area of productive functions. During this step the pupil has to be familiar with unique forms of actions, especially manual operations. The pupil also needs different forms of knowledge of manufacturing on a systems level of formative results, of the operative aids and machines which have been used during the process. The sloyd actions within this step are interactional, transactional and productional, and the strategies consequently rational, relational or tuning in. The pupil has to *know what, know how* and *know where to* in relation to the manufacturing work and the entire area of interest. The actions have to be carried out at least on an applied level of formative results. The results of the entire step is a concrete sloyd product.

(17) *Examining and finishing the work.* The motive-result ideal is to have a complete, well-made product as a result of the manufacturing process. This means that the pupil has to control the work object and to correct possible mistakes and to hedge the product. During this step it is not necessary to reach new areas of knowledge. The pupil's sloyd actions in this step are transactional, and consequently the strategies are relational. He/she has to *know how* in relation to the manufacturing work. The actions have to be carried out at least on an applied level of formative results. The result of the entire step is a completely finished sloyd product.

(18) *Evaluation.* The motive-result ideal is to get a holistic view of the entire educative sloyd process. The pupil has to consider and evaluate all the knowledge areas and all sloyd actions which have been actualised during the production process within the area of interest in relation to the working situation as a whole. In other words, both process, product and situational criteria have to be taken into consideration on a systems level of formative results.

The result of the *entire process,* which has to be evaluated in this step, is the concrete sloyd product, which has been in the pupil's mind as a motive-result ideal during the entire process, and the learned knowledge and abilities which will give an internal meaning, individual maturity, as a result of the theoretical and productional work during the production process, the educative sloyd process, within the area of interest (Lindfors, 1991a, pp. 92-102, 1992b, pp. 80-96).

Because the description above concerns the pupils educative sloyd process the didactics concerning teaching will not be actualised in the evaluation.

Examples of how the theory presented above has been applied in researsh are to be found in Appendix 2, Studies IX and XII.

8. Summing up – a hierarchical systems theory of sloyd education emerges

8.1. The theories as a hierarchical systems theory

The internationalization of teaching and research in the sloyd educational field was the main motive for summarizing and publishing in English earlier published individual theories. The starting point of the methodological framework in the research was to conceive the research objects as integrated entities of dynamic-evolutional systems, which could be studied by the aid of soft systems methodology. Systems and subsystems are hierarchic by nature, that is, they exist on different system levels in relation to each other. The individual theories in this report represent hierarchical systems, which could be subordinated to each other as illustrated in Figure 8.1:1. On each level there will be subsystems including elements which are connected with each other through different kinds of *relations*. All relations which make the system holistic form the structure of the system. The relations within and outside a system are regulated through different *functions*, which in turn are steered by a *flow of information* (input, output and feedback information).

Earlier it has been pointed out that theories presented in this report have to be used as instruments for understanding and structuring the sloyd educational field in the curriculum and syllabus as well as in research and education from a dynamic-evolutional point of view. *The knowledge of the generated theories is general and its reality-related form will be constituted in a context, i.e., in various educational areas and at various levels of the educational system.*

In their respective contexts the theories could be used as a basis for planning, carrying out, analysing and evaluating education (teaching-studying-learning) and research. Below I will summarize the individual theories (Figure 8.1:1).

(1) *The theory of sloyd education in various educational areas and at various levels within the educational system* offers a systems frame of reference for all the other theories presented below. The main idea of the systems theory is that the science of sloyd education emerges from a general core, which is common to the general (allround) direction and the vocational direction to be seen

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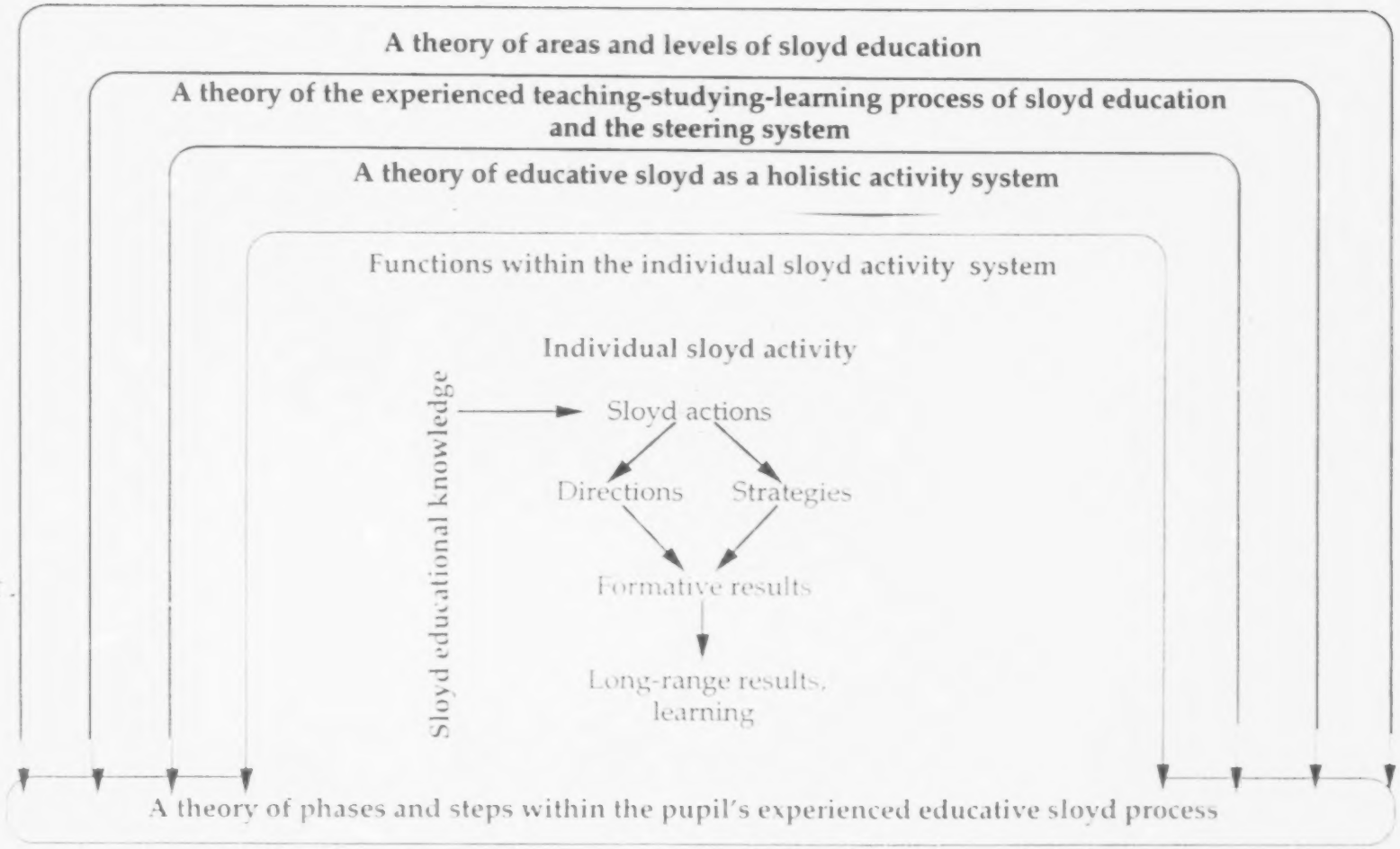
A theory of areas and levels of sloyd education
A theory of the experienced teaching-studying-learning process of sloyd education and the steering system
A theory of educative sloyd as a holistic activity system
Functions within the individual sloyd activity system
Individual sloyd activity
Sloyd educational knowledge
Sloyd actions
Directions
Strategies
Formative results
Long-range results, learning
A theory of phases and steps within the pupil's experienced educative sloyd process

Figure 8.1:1
An outline of the theory of sloyd education illustrated as a hierarchical systems theory.

in the field. Within these two directions there will be various levels of research and education, that is, sloyd at the academic level and at various school levels. The general (allround) direction has closer relations with the science of general education and the science of adult education, and the vocational direction has closer relations with crafts science and the science of vocational education. Each direction is related to other humanistic sciences. Technological and natural sciences influence crafts science and reach the science of sloyd education from the mentioned science.

(2)*The theory of the experienced teaching-studying-learning process and the normative steering system* could be used for the two directions mentioned in sloyd education; the general (allround) direction as well as the vocational direction. The theory offers a structure to both the normative system on various curriculum levels (frame factors and syllabus factors) and to the experienced teaching-studying-learning process. The experienced process includes teacher factors, pupil factors, interactive situational factors and result factors from both the teacher's and the pupils' point of view. Within the experienced teaching-studying-learning process the theory of educative sloyd as a holistic activity system, and the subtheories which constitute the whole, are to be found. In that way this theory offers a frame of reference for all theories presented below.

(3)*The theory of educative sloyd as a holistic activity system* offers a frame of reference for all forms of sloyd work and sloyd educational planning, teaching-studying-learning and research in sloyd education as well as research in educational craft and design (and "pure" craft and design). The holistic system comprises an aspect related to the individual (the world of the actor), a technological-aesthetic aspect (the technological-aesthetic world), a situation-related aspect (the world of social interaction) and an environment-related aspect (the surrounding world, culture and nature). The knowledge in each of these worlds is structured within various subdisciplines. For example, the actor's world comprises sloyd psychology and the aesthetic aspects of sloyd related to the individual, while the technological-aesthetic world is made up of sloyd technology, sloyd ergonomics and sloyd economy as well as of aesthetic aspects of sloyd related to production and products. Subdisciplines within the world of social interaction are sloyd sociology and sloyd ethics and within the surrounding world sloyd

ecology, sloyd ethnology and various cultural sciences. The activity within the system is organized and regulated by the individual (the actor) in action while expansion and progression appear within the system. In sloyd related to education, the didactic dimension is thus added. Overall levels are sloyd educational history, philosophy, theory of science and philosophy of science.

(4)*The theory of functions within the sloyd activity system* has been developed in order to describe the on-going activity, the actor's functions in sloyd education (the function of production, the function of interaction and the function of transaction), i. e. to point out the dynamic-evolutional perspectives. In the first place the theory was needed for analysing sloyd educational research (Lindfors, 1997), but the theory will be useful as providing a structured basis for other activities as well as research in sloyd education. The teacher (and perhaps also the pupil) will have to be aware of the different functions within the worlds of the holistic activity system in order to plan, carry out, analyse and evaluate teaching-studying-learning.

(5)*The theory of sloyd as an individual activity system* offers a structure to sloyd work carried out by a particular pupil within the teaching-studying-learning process. It will be easier for the teacher (and the pupil) to manage when the subsystems of the individual activity system are conscious and conceptualized. The pupil's motive-result ideal, the work object, the aids as well as the expected formative and material results will determine the teaching-studying strategies. The flow of information within and around the individual activity system is important to the actor's awareness. It will e. g. show how the work object and the aids will work together and give information about the pupil's readiness to act.

(6)*The theory of dimensions of educative sloyd actions* offers an internal structure of sloyd actions within the individual sloyd process and the holistic activity system to be conceptualized especially by the teacher. When the sloyd process concerns designing, planning of manufacturing and manufacturing, the internal sloyd actions have to be multifold and deeply conceptualized. If the teacher (and perhaps also the pupil) is conscious of the inner structure and meaning of modelling, transforming and realizing actions, he/she will be able to decide which level of readiness or competence is needed for the production process in question and

how to carry out the teaching in order to make the pupil's studying and learning meaningful.

The three dimensions in sloyd actions, modelling, transforming and realization, will appear simultaneously and have different emphasis within different phases of the sloyd process.

(7)*The theory of directions and strategies in educative sloyd actions* represent basic forms of sloyd actions. The strategies indicate the features of the direction with regard to the manner of approaching the work task. Both direction and strategy emerge from the character of the content, and the results are dependent on qualities of content as well as of direction and strategy.

The substantial content is made up of knowledge related to the production process, the work object and the method and situation (proceeding) within the sloyd actions (Chapter 6). The different types of content demand interactional, transactional or productional orientation depending on work tasks focused on at the moment. The three directions of sloyd actions represent different manifestations of goal-related psychical and physical activities which the actor has to be conscious of. The direction in its turn leads to different strategies (approaches), rational, relational or tuning-in sloyd actions on different result levels. The content within the sloyd actions is built up of different types of knowledge and of sloyd actions; the directions and strategies have to be congruent with the actual content. This fact will influence both the teacher's and the pupil's work.

(8)*The theory of formative results of educative sloyd actions and learning* achieved in the ongoing sloyd activity aimed at both external and internal objectives. Learning is a long-range result. Taxonomies have been developed for the two formative result dimensions. External knowledge-related levels are units, classes, relations and systems, and internal action-related levels are reproducing, applied, reorganizing and innovating.

(9)*The theory of knowledge areas within sloyd education* is in the first place knowledge related to the phases of the sloyd process (the production process) and the holistic working situation. That is, knowledge concerns designing technology (for the phase of designing) and manufacturing technology (for the phase of plan-

ning and manufacturig as well as the for the phase of manufacturing), methods and the working situation. In addition there has to be knowledge concerning the work object, and so-called overall knowledge areas which have to be applied in all school subjects.

(10) *The theory of the pupil's educative sloyd process* has in this report been presented as a frame of reference of *applied* activity systems (point 3-9 above) as well as a theory of its own. This theory ties the presented theories to a systems hierarchy, a wholeness surrounded by the theory of the teaching-studying-learning process (Chapter 4) and the theory of various educational areas and levels within the educational system (Chapter 3) as illustrated in Figure 8.1:1.

The theory of the pupil's educative sloyd process is divided into eighteen steps constituting three phases, the phase of designing, the phase of planning of manufacturing and the phase of manufacturing. Within each step various types of sloyd technological knowledge is used and goal-related sloyd actions are going on. With regard to the content, the sloyd actions proceed in different directions and different strategies have to be used. The work ends up in material and immaterial formative results on various levels and hopefully in long-range learning and fostering of the pupil.

8.2. Applying the theories in research

In this section my intention is to briefly describe how the theories have been used in sloyd educational research as frames of reference/theoretical basis for a research project, doctoral dissertations as well as in masters' and minor subject theses at Åbo Akademi University in Vasa.

Since 1993 the research project *Sloyd education in the cultural struggle: A research project on sloyd, competence to act and quality of life*, headed by myself, has been going on at Åbo Akademi University. The approach and the results so far have been described in the following way:

The aim of the project is to analyse the potential of sloyd education as a general (allround) educational subject, its socioeconomic and cultural consequences.

Soft systems methodology is used as a methodological frame of reference for various research methods, e.g. interviewing in the form of empathy sessions, diary analyses and questionnaires. Also the *phenomenographic* method has been used within the research.

The main results of the project can be divided into two categories: 1) Results on the level of a theory of science; i. e. sloyd educational ontology and epistemology, as well as the growth and the position of the sloyd educational science as an academic discipline and 2) normative bounded results; i. e. knowledge about school sloyd, its history, curriculum basis and importance for the pupil.

The individual theories which have been presented in this report have been partly developed and evaluated within this project because they have been used as the main frames of reference and as the theoretical basis of the studies. Seven research reports, two doctoral dissertations, one licentiate thesis, two minor subject theses and several articles have been published within the project. The history of sloyd as a school subject and an academic discipline have been research objects in separate studies.

The research reports, the doctoral theses and a few masters' theses are referred to as examples in *Appendix 2*. (See also the reference list.) The theories have been applied determining *overall perspectives, educational areas, level of education, frame of reference and focused perspectives.* The main aim of each study is presented as an introduction to the presentation.

Within a Nordic research network project, *Sloyd competence in Nordic culture: Life-forming functions of school sloyd/forming in individual and society-related perspectives,* headed by myself and Professor Juhani Peltonen at Turku University, the theories have been applied and developed as well.

8.3. Developing the paradigm

Sloyd education as well as crafts science have been established lately as academic disciplines. At Åbo Akademi University in Vasa, a sloyd educational paradigm has emerged over a period of ten years when the theories presented in this report were created. The theories have been developed by basic research and reported in

research reports and doctoral theses. They do not yet cover all areas and it is of course necessary to evaluate and further develop already created theories. The scientific knowledge has been used and evaluated in applied research in theses for various academic degrees. The sloyd educational theory/philosophy of science has lately been further developed in three articles (Lindfors, 1998, 1999a, 1999b).

In my analyses in 1997 (Lindfors, 1997) of the position of sloyd educational research presented in doctoral, licentiate and masters' theses at Åbo Akademi University I found out that the studies have mostly been concerned with the pupils' and the teachers' subjects within general (all-round) education. Future research therefore has to be concerned with the teacher educator's and the teacher student's subject at the general (all-round) education as well as on all subject levels in the vocational directed area (Chapter 3).

Furthermore, the analyses clarified that earlier basic and applied research has focused on sloyd didactics, sloyd technology and sloyd psychology. Future research therefore has to focus on other subdisciplines in the sloyd educational field, e.g. on subdisciplines in the world of social interaction (sloyd sociology, sloyd ethics) and the surrounding world (sloyd ethnology, sloyd ecology and cultural sciences).

Overall perspectives which have to be developed are especially sloyd educational research methodology and philosophy of science. The research will continue within the internal and the Nordic research project presented above (Section 8.2), and in connection with a planned international project concerning some European countries, Cuba and Japan.

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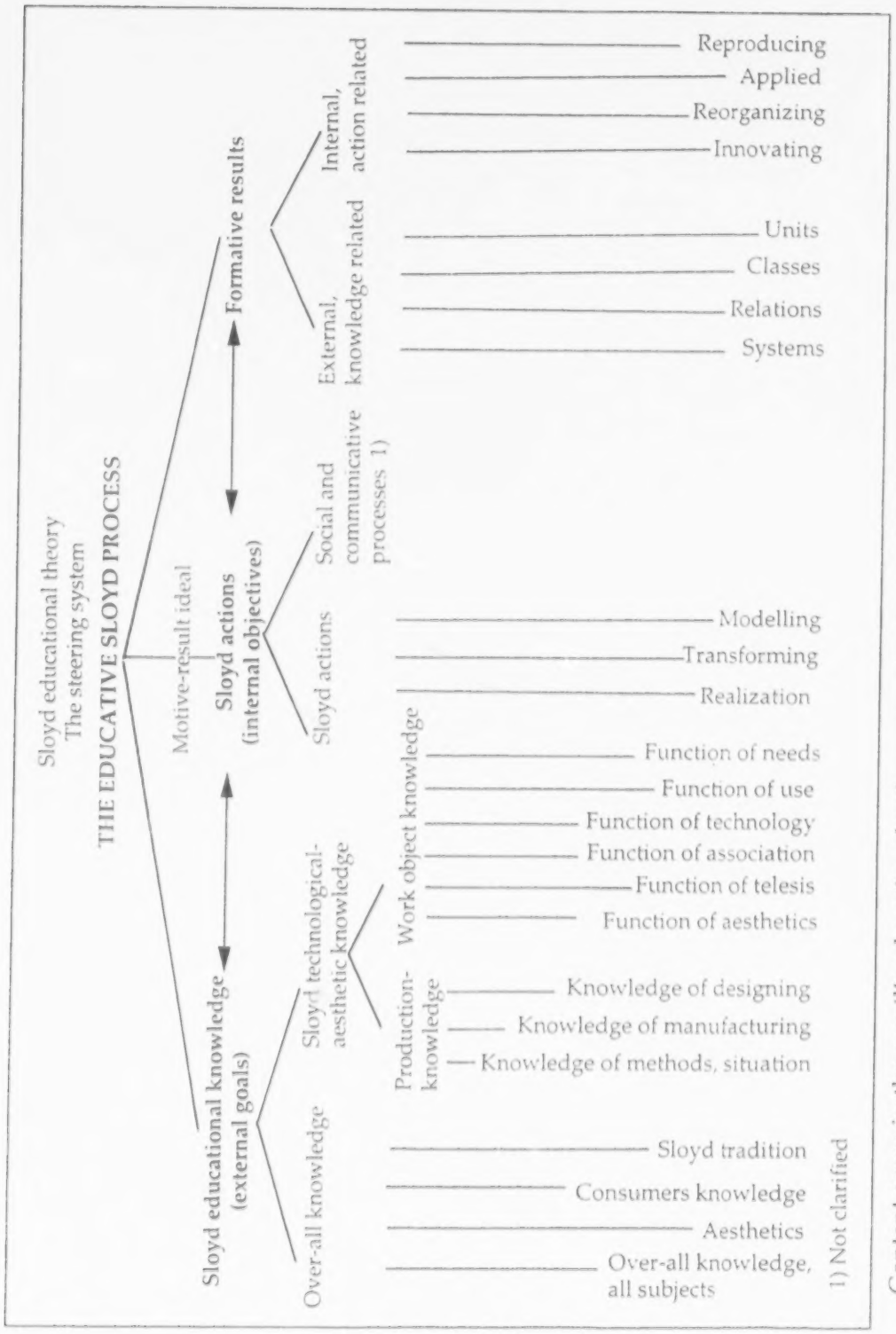
Appendix 1



Content areas in the pupil's educative sloyd process; sloyd educational knowledge, sloyd actions and formative results. (Modified from Lindfors, 1992b, p. 27.)

Appendix 2

List of sloyd educational research results as examples of how the theory presented in this report could be used in planning, carrying out, analysing and evaluating research.

I Sloyd Education in the Cultural Struggle. Part I . Studies in the curricula of the Finnish school subject sloyd 1912-1994.

Slöjdfostran i kulturkampen. Del I. Sudier i den finländska skolslöjdens läroplaner 1912-1994. (Lindfors, 1993b).

The main aim of the study was to examine the didactic and technological dimensions of the curricula of the school subject sloyd (educational craft) in Finnish schools from a historical perspective, and thereby provide a basis for the research project Sloyd Education in the Cultural Struggle.

Overall perspective::	History
Educational area:	School sloyd
Level of education:	The pupil's subject, the normative system
Frame of reference:	The theory of the normative and experienced teaching-studying-learning process of sloyd education
Focused perspective:	The function of transaction, curriculum level
Reporting:	Published research report

II Sloyd Education in the Cultural Struggle. Part II. An outline of the development of the science of sloyd education from a Finnish Perspective.

Slöjdfostran i kulturkampen. Del II. En översikt av slöjdpedagogikens utvecklingshistoria i ett finländskt perspektiv. (Lindfors, 1995)

The main aim of the study was to provide an outline of the development work that preceded the establishment of sloyd education as a main subject of studies for academic degrees in teacher education and doctoral studies.

Overall perspective:	History
Educational area:	Sloyd as an academic discipline
Level of education:	The researcher educator's, the doctoral student's, the teacher educator's, the teacher student's subject
Frame of reference:	The theory of educational areas and levels within the educational system
Focused perspective:	The function of transaction
Reporting:	Published research report

III Sloyd Education in the Cultural Struggle. Part III. Pupils' views of the importance of sloyd education. A local study.

Slöjdfostran i kulturkampen. Del III. Textilslöjdens betydelse ur elevperspektiv. En lokal undersökning. (Malmberg-Tulonen, 1995)

The main aim of the study was to examine empirically seventh – ninth graders' concept of importance of the school subject sloyd (educational craft) as an (allround) educative subject. The study focused on pupils' concept of applying sloyd knowledge in relation to other school subjects and to society.

Educational area:	School sloyd
Level of education:	The pupil's subject, the normative system
Frame of reference:	The theory of sloyd as a holistic activity system (modified)
Focused perspective:	The pupil and the function of transaction, curriculum level
Reporting:	Minor subject thesis/Published research report

IV Sloyd Education in the Cultural Struggle. Part IV. Determining the position of sloyd educational research. Analyses of theses presented at Åbo Akademi University.

Slöjdfostran i kulturkampen. Del IV. Positionsbestämning av slöjpedagogisk forskning. Analyser av lärdomsprov vid Åbo Akademi. (Lindfors, 1997)

The main aim of the study was to analyse and determine the position of theses in the field of sloyd education (in sloyd and class teacher education and postgraduate studies between 1990 and 1995) with regard of focused content areas and methodology. Sloyd educational research fields are presented as well as the scientific basis of the generation of theory and the development of the methodology are described.

Educational area:	Sloyd as an academic discipline
Level of education:	The doctoral student's, the teacher student's subject
Frames of reference:	The theory of educational areas and levels within the educational system and the theory of functions within the sloyd activity system
Focused perspectives:	All actors and all functions within the analysed doctoral dissertations and masters' theses
Reporting:	Published research report

V Sloyd Education in the Cultural Struggle. Part V. Students' conceptions of sloyd in the comprehensive school. An attempt to apply the phenomenographic method in research on sloyd education (Porko, 1997)

The main aim of the study was to clarify how the phenomenographic method could be used in sloyd educational research and to study primary school pupils' conceptions of sloyd empirically using the method in question.

Educational area:	School sloyd
Level of education:	The pupil's subject, the normative system
Frame of reference:	The theory of sloyd as a holistic activity system
Focused perspective:	The pupil and all functions as static contents
Reporting:	Minor subject thesis/Published research report

VI Sloyd Education in the Cultural Struggle. Part VI. The suggested and the experienced subject of teaching. A study of teaching in sloyd education.

Slöjdfostran i kulturkampen. Del VI. Det tänkta och det upplevda undervisningsämnet. En studie om undervisning i slöjdpedagogik. (Nygren-Landgärds, 1997)

The main aim of the study was that through basic research gain insight into didactically oriented technological courses as subjects of sloyd teaching and to search for subject areas and levels which constitute the science of sloyd education as a main subject in teacher education at the University level.

Overall perspective:	Theory of science
Educational area:	Sloyd as an academic discipline
Level of education:	The teacher educator's, the teacher student's subject
Frames of reference:	The theory of educational areas and levels within the educational system and the theory of functions within the sloyd activity system
Focused perspective:	The content of the subject and the principles of the teacher's/the student's functions in the teaching-studying-learning process
Reporting:	Licentiate thesis/Published research report

VII Cuban Sloyd. History and educational research on developing creativity. Four articles (Moreno Herrera, 1997).

The main aim of the articles presented in the report was to describe how the meeting between Nordic sloyd and the Cuban context resulted in the birth and development of a qualitatively new subject – Cuban sloyd, and to provide an outline of later research work focusing both on creativity from a technological perspective and creativity as part of the complex system of human processes with regard to sloyd education.

Overall perspective:	History
Educational area:	School sloyd

Level of education:	The pupil's subject, the normative system
Frame of reference:	The theory of the normative and experienced teaching-studying-learning process of sloyd education
Focused perspective:	The pupil and all functions
Reporting:	Published research report

VIII Discovering systems networks of educational sloyd. Analyses of the pupil's sloyd actions within a context. A paradigm-developing approach.

Att upptäcka systemnätverk i edukativ slöjd. Analyser av elevens slöjdhandlingar i en kontext. En paradigmutvecklande ansats.
(Malmberg, 1995)

The main aim of the study was to create context-related knowledge concerning the school subject sloyd on the secondary school level with regard to the pupils' point of view. Several analyses on different levels of analysis result in a theory of holistically organized sloyd actions within a context.

Overall perspective:	The theory of science
Educational area:	School sloyd
Level of education:	The pupil's subject
Frame of reference:	The theory of sloyd as a holistic activity system and the theory of functions within the sloyd activity system
Focused perspective:	The pupil/the teacher and function of interaction, function of production
Reporting:	Published doctoral dissertation

IX Cuban sloyd. An evolutional approach: theoretical perspective and empirical contribution (Moreno Herrera, 1998)

The main aim of the study was to provide a deeper theoretical understanding of the evalution of the subject sloyd and in this way a basis for its further development within the Cuban educational system, and furthermore searching for didactic procedures and their psychological bases, suitable to foster the holistic development of children.

Overall perspective:	History
Educational area:	School sloyd
Level of education:	The pupil's subject, the normative system
Frame of reference:	The theory of the normative and experienced teaching-studying-learning process of sloyd education, the theory of the pupil's educative sloyd process
Focused perspective:	The pupil and all functions
Reporting:	Published Doctoral dissertation

X The tools in the sloyd workshop.

Verktygen i slöjdsalen (Grägg & Kullman, 1992).

The main aim of the study was to clarify the importance of proper equipments within the pupils individual sloyd process and the possibilities of carrying out a meaningful sloyd education using the equipments offered by the schools, i. e. the regulations concerning aids within the function of production.

Educational area:	School sloyd
Level of education:	The teacher's subject, the normative system
Frame of reference:	The theory of sloyd as an individual activity system
Focused perspective:	The function of production (static), curriculum level
Reporting:	Unpublished Master's thesis

XI Using natural materials in weaving. Dimensions of sloyd actions within the frame of holistic teaching.

Vävning i naturmaterial. Dimensioner i slöjdhandlingar inom ramen för helhetsundervisning (Bonn & Söderlund, (1995).

The main aim of the study was to examine the pupils' modelling, transforming and realizing sloyd actions in connection with weaving in natural materials within the function of production in an operationalized teaching-studying-learning process.

Educational area:	School sloyd
Level of education:	The pupil's subject, the experienced level
Frame of reference:	The theory of dimensions of educative sloyd actions
Focused perspective:	The function of production
Reporting:	Unpublished Master's thesis

XII The phase of designing. A study of the primary school pupils' designing of an individual sloyd product.

Formgivningsfasen i slöjdprocessen. En undersökning om lågstadieeleversformgivning av en individuell slöjdprodukt (Hjulfors, 1994).

The main aim of the study was on a theoretical level to clarify the pupils' possibilities to design a personal sloyd product, taken in consideration specific critera for the totality of its functions. Primary school pupils' attitudes to design individual sloyd products was studied empirically.

Educational area:	School sloyd
Level of education:	The pupil's subject, the experienced level
Frame of reference:	The theory of the pupil's educative sloyd process
Focused perspective:	The function of production and the theory of knowledge related to the work object
Reporting:	Unpublished Master's thesis

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